SQUIRE'S COMPANION
TO THE
BRITISH PHARMACOPŒIA

EIGHTEENTH EDITION
1908

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BRITISH PHARMACOPŒIA

COMPARING THE STRENGTH OF ITS VARIOUS PREPARATIONS

WITH THOSE OF THE

UNITED STATES, AND OTHER FOREIGN PHARMACOPŒIAS,

TO WHICH ARE ADDED

NOT OFFICIAL PREPARATIONS,

AND

PRACTICAL HINTS ON PRESCRIBING.

BY

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Eighteenth Edition.

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The Board of Inland Revenue have consented to recognise 'Squire's Companion to the British Pharmacopœia' as a 'well known' book of reference in connection with the exemption from Medicine Stamp Duty in favour of 'known, admitted and approved' remedies.

PREFACE
TO EIGHTEENTH EDITION.

The Seventeenth Edition of Squire's Companion was published in 1899, and since that time a great advance has been made in the testing of Drugs and Chemicals used in medicine; a very large number of new synthetic products have also been introduced. Several foreign Pharmacopœias have issued new editions, viz., Austrian, Belgian, Danish, Dutch, French, German, Italian, Russian, Spanish, Swedish, Swiss and United States; the Japanese is a new Pharmacopœia.

To bring Squire's Companion up to date and to make it conform to modern requirements, it has been necessary to practically re-write it from cover to cover. The general arrangement of the book remains the same as before. Substances which are official in the British Pharmacopœia have the names in larger type than those which are 'Not Official,' and the same distinction also applies to the preparations, it is therefore quite easy to see at a glance whether any particular substance or preparation is official or not. This is, moreover, supplemented by a list of 'Official' and 'Not Official' preparations given under each substance immediately following the dose, so that a prescriber can quickly ascertain the various forms in which any medicament can be given. Following the precedent of the previous editions, the formulas are given in parts, solids by weight, liquids by measure, and where it has been necessary to depart from this course, it is stated in the text. In dealing with German and other Continental Pharmacopœias, it must be understood that parts refer to parts by weight.

The arrangement of the matter and the headings to the several paragraphs, which have always been the distinctive feature of the Companion, have been retained—'Solubility,' 'Medicinal Properties,' 'Dose,' 'Prescribing Notes,' 'Incompatibles,' list of 'Official Preparations,' 'Antidotes,' and 'Foreign Pharmacopœias,' this arrangement having been found very convenient to those who use the work as a book of reference. The term 'Medicinal Properties,' although very old-fashioned, has been retained in order to keep the plan of the book uniform with previous editions; this portion has been carefully read and corrected by Dr. Taylor Grant.

The 'Descriptive Notes' have been written specially for this book by Mr. E. M. Holmes; they deal with the principal distinguishing features of the vegetable drugs, the commercial qualities, and the probable contaminations and sophistications. He has also assisted in the revision of the Organic Materia Medica.

The 'Tests' have been entirely re-written, and include a critical comparison of the tests given in the Pharmacopœias of Great Britain, Germany, and the United States of America, together with such further tests as have been found useful in the laboratory of the Author. The French Codex, so recently published, could not be included in the critical comparison mentioned above, but the more important tests therein contained have been dealt with, and this work has delayed the publication of the COMPANION beyond the time at which it was intended to have been ready.

The standardisation of preparations is exciting special interest, and considerable attention has been devoted to this subject, the standards and methods for ensuring them, which are employed in various Pharmacopœias are given, and are supplemented by figures which have been obtained from work devoted to this purpose in the author's laboratory.

A large number of formulas which appear in the British Pharmaceutical Codex are compared with those previously published in books of reference in common use.

The chapter on Therapeutic Agents of Microbial Origin has been revised and partly re-written by Dr. R. Tanner Hewlett.

The author wishes to acknowledge his indebtedness to the members of his staff who have assisted in the preparation of this edition, and to various friends who have supplied information on subjects with which their names have been particularly associated. His thanks are specially due to Mr. Charles M. Caines, who has devoted the whole of his attention to the Chemical portion, and who has been the principal chemist employed on the experimental work.

P. W. SQUIRE.

413 *Oxford Street*,
November, 1908.

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ABBREVIATIONS.

Allen = Allen's Commercial Organic Analysis.
A.J.P. = American Journal of Pharmacy.
B.M.J. = British Medical Journal.
B.M.J.E. = British Medical Journal Epitome.
B.P. = British Pharmacopœia, 1898.
B.P.C. Formulary = British Pharmaceutical Conference (Unofficial Formulary, 1901).
B.P.C. = British Pharmaceutical Codex (1907) and Corrections.
Brompton = Pharmacopœia of the Brompton Hospital for Consumption, 1899.
Brussels Conference = International Agreement respecting the Unification of the Pharmacopœial Formulas for Potent Drugs (Signed at Brussels, November 29, 1906).
Charing Cross = Pharmacopœia of the Charing Cross Hospital, 1904.
C.F. = Canadian Formulary of Unofficial Preparations.
C.D. = Chemist and Druggist.
Central Throat = Pharmacopœia of the Central London Throat and Ear Hospital, 1901.
City of London Chest = Pharmacopœia of the City of London Hospital for Diseases of the Chest, 1900.
East London = Pharmacopœia of the East London Hospital for Children, 1903.
Evelina = Pharmacopœia of the Evelina Hospital for Sick Children, 1906.
F.T. = Folia Therapeutica.
Great Northern = Pharmacopœia of the Great Northern Central Hospital, 1899.
G.P. = General Practitioner.
Guy's = Pharmacopœia of Guy's Hospital, 1899.
Hager = Hager's Handbuch der Pharmaceutischen Praxis.
Ind. and Col. Add. = Indian and Colonial Addendum to the British Pharmacopœia.
I.M.G. = Indian Medical Gazette.
I.M.R. = Indian Medical Record.
J.C.S. Abs. = Journal of the Chemical Society Abstracts.
J.C.S. Trans. = Journal of the Chemical Society Transactions.
J.C.S.I. = Journal of the Society of Chemical Industry.
King's = Pharmacopœia of King's College Hospital, 1901.
L. = Lancet.
Lock = Pharmacopœia of the London Lock Hospital, 1896.
London = Pharmacopœia of the London Hospital, 1903.
L.M.R. = London Medical Recorder.
London Ophthalmic = Pharmacopœia of the Royal London Ophthalmic Hospital (late Moorfields), 1901.
London Skin = Pharmacopœia of the London Skin Hospital, 1903.
Martindale = Martindale and Westcott's Extra Pharmacopœia.
M.A. = Medical Annual.
M.P. = Medical Press and Circular.
M.T. = Medical Times and Gazette.
Merck = Merck's Archives.
Middlesex = Pharmacopœia of the Middlesex Hospital, 1899.
Murrell = What to do in Cases of Poisoning (Murrell).
Ph. Edin. = Edinburgh Pharmacopœia.
Pharm. Form. = Pharmaceutical Formulas (Peter MacEwan).
P.G. = Pharmacopœia Germanica (Editio IV.).
P.J. = Pharmaceutical Journal (Second, Third, and Fourth Series).
P.J.F. = Pharmaceutical Journal Formulary.

Ph. Lond. = Pharmacopœia Londinensis, 1851.
P.R. = Pharmaceutical Record (New York).
Pr. = Practitioner.
Proc. Amer. Pharm. Assoc. = Proceedings of the American Pharmaceutical Association.
Ringer = Ringer's Handbook of Therapeutics.
Royal Chest = Pharmacopœia of the Royal Hospital for Diseases of the Chest, 1893.
R.D.H. = Pharmacopœia of the Royal Dental Hospital, 1907.
Royal Free = Pharmacopœia of the Royal Free Hospital, 1904.
Samaritan = Pharmacopœia of the Samaritan Free Hospital, 1906.
St. Bartholomew's = Pharmacopœia of St. Bartholomew's Hospital, 1900.
St. George's = Pharmacopœia of St. George's Hospital, 1907.
St. John's = Pharmacopœia of St. John's Hospital for Diseases of the Skin, 1898.
St. Mary's = Pharmacopœia of St. Mary's Hospital, 1904.
St. Thomas's = Pharmacopœia of St. Thomas's Hospital, 1902.
Schimmel = Schimmel's Semi-Annual Reports.
Sheffield Union = Pharmacopœia of the Sheffield Union, 1903.
Sick Children (G.O.S.) = Pharmacopœia of the Hospital for Sick Children, Great Ormond St., 1900.
Squibb = Squibb's Ephemeris.
T.G. = Therapeutic Gazette (Philadelphia).
Throat = Pharmacopœia of the Hospital for Diseases of the Throat, Golden Square, 1901.
U.S.P. = United States Pharmacopœia.
U.S.N.F. = National Formulary of the American Pharmaceutical Association.
University = Pharmacopœia of the University College Hospital, 1904.
University (1907) = Pharmacopœia of the University College Hospital, 1907.
Victoria = Pharmacopœia of the Victoria Hospital for Children, 1904.
Westminster = Pharmacopœia of the Westminster Hospital, 1902.
Westminster Ophthalmic = Pharmacopœia of the Royal Westminster Ophthalmic Hospital, 1903.
Women = Pharmacopœia of the Hospital for Women, 1883.
Y.B.P. = Year-book of Pharmacy.

EXAMPLE :—*L.* '04, i. 56, refers to Lancet, 1904, Volume I., page 56.

The British Pharmacopœia, published in 1898, is in this work compared with the latest editions of the foreign Pharmacopœias, which are as follows :—

Austrian . . .	published in 1906	Mexican . . .	published in 1896
Belgian . . .	,, ,, 1906	Norwegian . .	,, ,, 1895
Danish . . .	,, ,, 1907	Portuguese . .	,, ,, 1876
Dutch . . .	,, ,, 1905	Russian . .	,, ,, 1902
French . . .	,, ,, 1908	Spanish . . .	., ,, 1905
German . . .	,, ,, 1900	Swedish . . .	,, ,, 1901
Hungarian . .	,, ,, 1888	Swiss	,, ,, 1907
Italian . . .	,, ,, 1902	United States .	,, ,, 1905
Japanese . .	,, ,, 1907		

and are thus expressed—Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss, U.S.

The following works have also been consulted :—'United States Dispensatory'; Dorvault, 'L'Officine'; Gray's 'Supplement'; Gildemeister and Hoffmann, 'Volatile Oils'; Parry, 'Chemistry of Essential Oils'; Sutton, 'Volumetric Analysis'; Fluckiger and Hanbury, 'Pharmacographia'; Vogl, 'Anatomischer Atlas zur Pharmakognosie'; Vogl, 'Pharmakognosie'; Planchon and Collin, 'Les Drogues Simples d'Origine Vegetale'; Tschirch and Oesterle, 'Anatomischer Atlas'; Moeller, 'Leitfaden zu Microscopisch-pharmacognostischen Übungen'; Schneider, 'Powdered Vegetable Drugs'; Greenish and Collin, 'An Anatomical Atlas of Vegetable Powders'; Koch, 'Die Microscopische Analyse der Drogenpulver.'

SYMBOLS, AND ATOMIC WEIGHTS OF THE ELEMENTARY BODIES, MENTIONED IN THE BRITISH PHARMACOPŒIA.

H = 1·00.

Elementary Bodies.	Symbols and Atomic Weights.	International Atomic Weights. H = 1.
Aluminium	Al = 26·90	26·90
Antimony (Stibium)	Sb = 119·00	119·30
Arsenium	As = 74·50	74·40
Barium	Ba = 136·40	136·40
Bismuth	Bi = 207·30	206·90
Boron	B = 10·85	10·90
Bromine	Br = 79·35	79·36
Calcium	Ca = 39·71	39·80
Carbon	C = 11·91	11·91
Cerium	Ce = 139·20	139·20
Chlorine	Cl = 35·19	35·18
Chromium	Cr = 51·74	51·70
Copper (Cuprum)	Cu = 63·12	63·10
Gold (Aurum)	Au = 195·70	195·70
Hydrogen	H = 1·00	1·00
Iodine	I = 125·90	125·90
Iron (Ferrum)	Fe = 55·60	55·50
Lead (Plumbum)	Pb = 205·35	205·35
Lithium	Li = 6·97	6·98
Magnesium	Mg = 24·18	24·18
Manganese	Mn = 54·52	54·60
Mercury (Hydrargyrum)	Hg = 198·80	198·50
Nitrogen	N = 13·94	13·93
Oxygen	O = 15·88	15·88
Phosphorus	P = 30·80	30·77
Platinum	Pt = 193·30	193·30
Potassium (Kalium)	K = 38·83	38·86
Silver (Argentum)	Ag = 107·11	107·12
Sodium (Natrium)	Na = 22·88	22·88
Sulphur	S = 31·82	31·83
Tin (Stannum)	Sn = 118·20	118·10
Zinc	Zn = 64·91	64·90

THE WEIGHTS AND MEASURES OF THE BRITISH PHARMACOPŒIA

AT THE TEMPERATURE OF 60° FAHRENHEIT.

WEIGHTS.

The Avoirdupois pound = 16 oz. = 7000 grains.
1 oz. = 437·5 grains.
1 gr. = 1 grain.

In addition to the use of the Imperial weights it is permitted in the Act of 1878 that drugs when sold by retail may be sold by apothecaries' weight. The use in trade of a weight or measure of the metric system was made lawful by the Weights and Measures (Metric System) Act, 1897.

The Preface to the British Pharmacopœia states: 'It is strongly urged upon all medical men to avoid the use of the terms ounce and pound with reference to any other than the avoirdupois or Imperial Standard weight; but it is still optional with the physician *in prescribing* to use the symbols ℈ (scruple) and ʒ (drachm), the former representing 20 and the latter 60 grains. . . . In the measurement of liquids the Imperial measure is used for higher denominations, and the fluid ounce and its subdivisions into fluid drachms and minims for the lower denominations of volume.'

MEASURES.

The Imperial gallon contains 277·274 cubic inches of distilled water at 60° F.

C	1 gallon	= 8 pints,	weighing 10 pounds,	contains 76,800 minims.
O	1 pint	=20 fluid ounces	,, 1¼ ,,	,, 9,600 ,,
fl. oz.	1 fluid ounce	= 8 fluid drachms	,, 437·5 grains	,, 480 ,,
fl. drm.	1 fluid drachm	=60 minims	,, 54·68 ,,	,, 60 ,,
♏	1 minim		,, ·91 grain	,, 1 minim.

It must be remembered that the minim is less than the grain measure; 109·7143 minims (taken as 110 minims throughout *B.P.* '98) = the volume of 100 grains of Water at 60° F. (15·5° C.).

To find the capacity in gallons of any rectangular vessel, multiply the length in inches by the breadth, and the product by the depth in inches, then divide the total by 277·278, which is the number of cubic inches contained in the gallon.

To find the capacity in gallons of a cylindrical vessel, multiply the square of half the diameter in inches by 3·1416 and the resulting figure by the depth in inches; divide the result by 277·278.

Graduated measures may be checked with good weights and scales, and distilled water. Every fluid ounce of distilled water at 60° F. (15·5° C.) weighs an ounce avoirdupois, but there are two lines on the surface of a liquid; the upper one is that of capillary attraction to the sides of the vessel; the lower one the exact surface of the fluid. This should be on a line with the eye to measure accurately.

The Continental Pharmacopœias give the formulas in parts by weight; in some instances the gramme is indicated as the unit. The formulas in the United States Pharmacopœia are given in grammes and cubic centimetres.

The British Pharmacopœia still gives the formulas in weights and measures, both by the Imperial and the metric systems. Liquids are as a rule ordered by measure, but there is no uniformity in this: for instance, in Linimentum Terebinthinæ Aceticum the Glacial Acetic Acid is weighed, but in Acetum Cantharidis it is measured; in Oxymel the clarified Honey is weighed, but in Oxymel Scillæ it is measured. Glycerin and other fluids, in some preparations are weighed, in others they are measured.

METRICAL MEASURES.

ALSO RELATION OF THE METRICAL MEASURES TO THE MEASURES OF THE BRITISH PHARMACOPŒIA.

LENGTH.

1 Millimetre = the thousandth part of a metre, or 0·001 metre = 0·03937 inch.
1 Centimetre = the hundredth ,, 0·01 ,, = 0·39371 ,,
1 Decimetre = the tenth part ,, 0·1 ,, = 3·93708 inches.
1 Metre = 39·37079 inches, or 1 yard 3·37 inches nearly.

1 Line = $\frac{1}{12}$ inch.
1 Inch = $\frac{1}{12}$ foot. = 0·02540 metre, or 25·40 millimetres.
12 Inches = 1 foot. = 0·30480 metre, or 30·48 centimetres.
36 ,, = 3 feet = 1 yard. = 0·914399 metre.
Length of pendulum vibrating seconds of mean time in the latitude of London, in a vacuum at the level of the sea . } 39·1393 inches.

It is remarkable that the English and French standards, taken from such different sources, should so nearly agree:—

The English, from the length of a pendulum vibrating seconds of mean time; from which the yard (36 inches) is computed . } 39·1393.
The French being the ten-millionth part of a quarter of the earth's meridian, and called a metre . . . . } 39·37079.

CAPACITY.

1 Millilitre = 1·00016 cubic centimetre, or the volume of 1 gramme of water at 4°C.
1 Centilitre = ,, 10 grammes ,, ,,
1 Decilitre = ,, 100 ,, ,, ,,
1 Litre or 1000 Millilitres = } 1·0016 cubic decimetre ,, 1000 ,, (1 kilo) ,,

1 Cubic Centimetre = ·99984 millilitre.
1 Cubic Decimetre (1000 c.c.) = ·99984 litre.
1 Cubic Centimetre = 15·43235 grain-measures of 16·9 minims nearly.
1 Litre = 1·7598 pints, 35¼ fl. oz. and 11 minims, or 15432·348 grain-measure.
1 Gallon = 4·5449631 litres.
1 Pint = ·5682454 litre, or 568·336 cubic centimetres nearly.
1 Fluid Ounce = ·0284123 litre, or 28·417 cubic centimetres nearly.
1 Fluid Drachm = ·003552 litre, or 3·552 cubic centimetres nearly.
1 Minim = ·000059 litre, or ·056 cubic centimetre nearly.

EQUIVALENTS OF ENGLISH WEIGHTS TO FRENCH GRAMMES.

1 pound avoirdupois	7000 grains	or 16 ounces	=	453·592 French grammes.
	6562·5	or 15	=	425·2425 ,, ,,
	6125	or 14	=	396·8925 ,, ,,
	5687·5	or 13	=	368·5435 ,, ,,
	5250	or 12	=	340·1935 ,, ,,
	4812·5	or 11	=	311·8445 ,, ,,
	4375	or 10	=	283·495 ,, ,,
	3937·5	or 9	=	255·1455 ,, ,,
	3500	or 8	=	226·796 ,, ,,
	3062·5	or 7	=	198·4465 ,, ,,
	2625	or 6	=	170·097 ,, ,,
	2187·5	or 5	=	141·7475 ,, ,,
	1750	or 4	=	113·398 ,, ,,
	1312·5	or 3	=	85·0485 ,, ,,
	875	or 2	=	56·699 ,, ,,
1 ounce,	437·5	or 1	=	28·3495 ,, ,,
	218·75	or ½	=	14·17475 ,, ,,
	109·37	or ¼	=	7·08737 ,, ,,
	15·43		=	1
	1·543		=	·1, a decigramme.
1 grain,	1		=	·0648
	·15 or $\frac{1}{7}$ nearly		=	·01, a centigramme.
	·015 or $\frac{1}{66}$ nearly		=	·001, a milligramme (nearly).

MEASURES, EQUIVALENTS OF FRENCH GRAMMES TO ENGLISH WEIGHTS.

1 Litre = 1 kilogramme,	1000 French grammes	=	35 ounces	and 120 grains.
	900	=	31	and 326¾ ,,
	800	=	28	and 96 ,,
	700	=	24	and 302¾ ,,
	600	=	21	and 72 ,,
	500	=	17	and 278¾ ,,
	400	=	14	and 48 ,,
	300	=	10	and 254¾ ,,
	200	=	7	and 24 ,,
1 Decilitre = 1 hectogramme,	100	=	3	and 230¾ ,,
	90	=	3	and 76⅓ ,,
	80	=	2	and 359½ ,,
	70	=	2	and 205⅓ ,,
	60	=	2	and 51 ,,
	50	=	1	and 334 ,,
	40	=	1	and 179¾ ,,
	30	=	1	and 25½ ,,
	20	=		308⅔ ,,
1 Centilitre = 1 decagramme	10	=		154⅓ ,,
	5	=		77⅙ ,,
1 Millilitre = *1 gramme,	1	=		nearly 15½ ,,
	·5	=		,, 7¾ ,,
1 decigramme,	·1	=		,, 1½ ,,
	·05	=		,, ¾ ,,
1 centigramme,	·01	=		,, $\frac{1}{7}$,,
	·005	=		,, $\frac{1}{13}$,,
1 milligramme,	·001	=		,, $\frac{1}{65}$,,

---

* A *Millilitre* is the volume of one gramme of Distilled Water at its greatest density, 4° C. (39·2° F.). A *Cubic Centimetre* is the volume of the same weight of water at 60° F. (15·5° C.).

IMPERIAL WEIGHTS AND MEASURES

WITH THE METRIC EQUIVALENTS.

Minims.	C.C.	Minims.	C.C.	Grain.	Gramme.	Grains.	Grammes.
1	0·06	23	1·36	$\frac{1}{500}$	0·00012	1	0·065
2	0·12	24	1·42	$\frac{1}{250}$	0·00025	2	0·13
3	0·18	25	1·5	$\frac{1}{240}$	0·00027	3	0·20
4	0·24	26	1·54	$\frac{1}{200}$	0·00032	4	0·26
5	0·30	27	1·60	$\frac{1}{150}$	0·00043	5	0·32
6	0·36	28	1·66	$\frac{1}{120}$	0·00054	6	0·40
7	0·42	29	1·70	$\frac{1}{100}$	0·00065	7	0·46
8	0·50	30	1·80	$\frac{1}{75}$	0·0009	8	0·52
9	0·54	32	1·90	$\frac{1}{64}$	0·00101	9	0·60
10	0·6	34	2·00	$\frac{1}{60}$	0·0011	10	0·65
11	0·66	36	2·12	$\frac{1}{50}$	0·0013	11	0·72
12	0·72	38	2·24	$\frac{1}{32}$	0·002	12	0·78
13	0·78	40	2·36	$\frac{1}{25}$	0·0027	13	0·84
14	0·84	45	2·66	$\frac{1}{24}$	0·00274	14	0·91
15	0·9	60 or 1 fl. drm.	3·6	$\frac{1}{16}$	0·0040	15	1·00
16	0·96			$\frac{1}{12}$	0·0054	16	1·04
17	1·0	120 or 2 fl. drm.	7·1	$\frac{1}{8}$	0·0081	17	1·10
18	1·06	180 or 3 fl. drm.	10·6	$\frac{1}{6}$	0·0108	18	1·17
19	1·12			$\frac{1}{4}$	0·0162	19	1·24
20	1·20	240 or 4 fl. drm.	14·2	$\frac{1}{3}$	0·0216	20	1·30
21	1·25	480 or 8 fl. drm. or 1 fl. oz.	28·4	$\frac{1}{2}$	0·032	25	1·62
22	1·30			$\frac{3}{4}$	0·05	30	2·00

TABLE OF COMPARISON OF THE FAHRENHEIT WITH THE CENTIGRADE* AND RÉAUMUR'S THERMOMETER.

Fahr.	Cent.	Réau.	Fahr.	Cent.	Réau.	Fahr.	Cent.	Réau.
212	100	80	136·4	58	46·4	60·8	16	12·8
210·2	99	79·2	134·6	57	45·6	59	15	12
208·4	98	78·4	132·8	56	44·8	57·2	14	11·2
206·6	97	77·6	131	55	44	55·4	13	10·4
204·8	96	76·8	129·2	54	43·2	53·6	12	9·6
203	95	76	127·4	53	42·4	51·8	11	8·8
201·2	94	75·2	125·6	52	41·6	50	10	8
199·4	93	74·4	123·8	51	40·8	48·2	9	7·2
197·6	92	73·6	122	50	40	46·4	8	6·4
195·8	91	72·8	120·2	49	39·2	44·6	7	5·6
194	90	72	118·4	48	38·4	42·8	6	4·8
192·2	89	71·2	116·6	47	37·6	41	5	4
190·4	88	70·4	114·8	46	36·8	39·2	4	3·2
188·6	87	69·6	113	45	36	37·4	3	2·4
186·8	86	68·8	111·2	44	35·2	35·6	2	1·6
185	85	68	109·4	43	34·4	33·8	1	0·8
183·2	84	67·2	107·6	42	33·6	32	0	0
181·4	83	66·4	105·8	41	32·8	30·2	– 1	– 0·8
179·6	82	65·6	104	40	32	28·4	– 2	– 1·6
177·8	81	64·8	102·2	39	31·2	26·6	– 3	– 2·4
176	80	64	100·4	38	30·4	24·8	– 4	– 3·2
174·2	79	63·2	98·6	37	29·6	23	– 5	– 4
172·4	78	62·4	96·8	36	28·8	21·2	– 6	– 4·8
170·6	77	61·6	95	35	28	19·4	– 7	– 5·6
168·8	76	60·8	93·2	34	27·2	17·6	– 8	– 6·4
167	75	60	91·4	33	26·4	15·8	– 9	– 7·2
165·2	74	59·2	89·6	32	25·6	14	–10	– 8
163·4	73	58·4	87·8	31	24·8	12·2	–11	– 8·8
161·6	72	57·6	86	30	24	10·4	–12	– 9·6
159·8	71	56·8	84·2	29	23·2	8·6	–13	–10·4
158	70	56	82·4	28	22·4	6·8	–14	–11·2
156·2	69	55·2	80·6	27	21·6	5	–15	–12
154·4	68	54·4	78·8	26	20·8	3·2	–16	–12·8
152·6	67	53·6	77	25	20	1·4	–17	–13·6
150·8	66	52·8	75·2	24	19·2	– 0·4	–18	–14·4
149	65	52	73·4	23	18·4	– 2·2	–19	–15·2
147·2	64	51·2	71·6	22	17·6	– 4	–20	–16
145·4	63	50·4	69·8	21	16·8	– 5·8	–21	–16·8
143·6	62	49·6	68	20	16	– 7·6	–22	–17·6
141·8	61	48·8	66·2	19	15·2	– 9·4	–23	–18·4
140	60	48	64·4	18	14·4	–11·2	–24	–19·2
138·2	59	47·2	62·6	17	13·6	–13	–25	–20

Reductions from one scale to another are easily made by the following calculation:—

Fahrenheit to Centigrade, deduct 32°, multiply by 5, and divide by 9.
Centigrade to Fahrenheit, multiply by 9, divide by 5, and add 32°.
Réaumur to Fahrenheit, multiply by 9, divide by 4, and add 32°.

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* Celsius first proposed this scale, which is also called 'Celsius.'

ALCOHOL TABLE.

Specific Gravity at 60° F. (15·6° C.).	Absolute Alcohol by weight. Per cent.	Absolute Alcohol by volume. Per cent.	Specific Gravity at 60° F. (15·6° C.).	Absolute Alcohol by weight. Per cent.	Absolute Alcohol by volume. Per cent.
1·000	0·00	0·00	·894	60·67	68·33
·998	1·06	1·34	·892	61·50	69·11
·996	2·28	2·86	·890	62·36	69·92
·994	3·41	4·27	·888	63·26	70·77
·992	4·62	5·78	·886	64·13	71·58
·990	5·87	7·32	·884	65·00	72·38
·988	7·27	9·04	·882	65·83	73·15
·986	8·64	10·73	·880	66·70	73·93
·984	10·08	12·49	·878	67·54	74·70
·982	11·62	14·37	·876	63·38	75·45
·980	13·15	16·24	·874	69·21	76·20
·978	14·82	18·25	·872	70·04	76·94
·976	16·46	20·24	·870	70·84	77·64
·974	18·08	22·18	·868	71·67	78·36
·972	19·67	24·08	·866	72·52	79·12
·970	21·31	26·04	·864	73·38	79·86
·968	22·85	27·86	·862	74·23	80·60
·966	24·38	29·67	·860	75·14	81·40
·964	25·86	31·40	·858	76·04	82·19
·962	27·21	32·98	·856	76·88	82·90
·960	28·56	34·54	·854	77·71	83·60
·958	29·87	36·04	·852	78·52	84·27
·956	31·00	37·34	·850	79·32	84·93
·954	32·25	38·75	·848	80·13	85·59
·952	33·47	40·14	·846	80·96	86·28
·950	34·52	41·32	·844	81·76	86·93
·948	35·50	42·40	·842	82·54	87·55
·946	36·56	43·56	·840	83·31	88·16
·944	37·67	44·79	·838	84·08	88·76
·942	38·78	46·02	·836	84·88	89·38
·940	39·80	47·13	·834	85·65	89·99
·938	40·80	48·21	·832	86·42	90·58
·936	41·80	49·29	·830	87·19	91·17
·934	42·76	50·31	·828	87·96	91·75
·932	43·71	51·32	·826	88·76	92·36
·930	44·64	52·29	·824	89·54	92·94
·928	45·55	53·24	·822	90·29	93·49
·926	46·46	54·19	·820	91·00	94·00
·924	47·36	55·13	·818	91·71	94·51
·922	48·27	56·07	·816	92·44	95·03
·920	49·16	56·98	·814	93·18	95·55
·918	50·09	57·92	·812	93·92	96·08
·916	50·96	58·80	·810	94·62	96·55
·914	51·79	59·63	·808	95·32	97·02
·912	52·68	60·52	·806	96·03	97·51
·910	53·57	61·40	·804	96·70	97·94
·908	54·48	62·31	·802	97·37	98·37
·906	55·41	63·24	·800	98·03	98·80
·904	56·32	64·14	·798	98·66	99·16
·902	57·21	65·01	·796	99·29	99·55
·900	58·05	65·81	·794	99·94	99·96
·898	58·95	66·69	·7938	100·00	100·00
·896	59·83	67·53			

BEAUME'S HYDROMETER COMPARED WITH THE SPECIFIC GRAVITY OF LIQUIDS HEAVIER THAN WATER.

1·000 BEING TAKEN AS THE SPECIFIC GRAVITY OF DISTILLED WATER AT 15·5° CENTIGRADE = 60° FAHRENHEIT.

Beaumé.	Sp. Gr.	Beaumé.	Sp. Gr.
0	1·000	39	1·367
1	1·007	40	1·380
2	1·014	41	1·394
3	1·021	42	1·407
4	1·028	43	1·421
5	1·036	44	1·435
6	1·043	45	1·449
7	1·051	46	1·464
8	1·058	47	1·479
9	1·066	48	1·494
10	1·074	49	1·510
11	1·082	50	1·526
12	1·090	51	1·542
13	1·098	52	1·558
14	1·107	53	1·575
15	1·115	54	1·593
16	1·124	55	1·610
17	1·133	56	1·628
18	1·142	57	1·647
19	1·151	58	1·666
20	1·160	59	1·685
21	1·169	60	1·705
22	1·179	61	1·725
23	1·188	62	1·746
24	1·198	63	1·767
25	1·208	64	1·789
26	1·218	65	1·811
27	1·229	66	1·834
28	1·239	67	1·857
29	1·250	68	1·882
30	1·261	69	1·906
31	1·272	70	1·932
32	1·283	71	1·958
33	1·294	72	1·984
34	1·306	73	2·011
35	1·318	74	2·040
36	1·330	75	2·069
37	1·342	76	2·099
38	1·355	77	2·130

Specific Gravity of Syrups, etc., may be tested with a ten-ounce measure. Ten measured ounces of simple syrup should weigh nearly thirteen ounces and 146 grains, representing the sp. gr. 1·330.

MATERIA MEDICA TABLE

See Notes

B.P. Name.	Obtained from.	Natural Order.	Geographical Source.
Acaciæ Cortex	Acacia Arabica and Acacia decurrens	Leguminosæ (Fabaceæ)	Africa, Australia and India
Acaciæ Gummi	Acacia Senegal, and other species	,,	Khordofan, in Eastern Africa
Acalypha	Acalypha Indica	Euphorbiaceæ	India
Aconiti Folia	Aconitum 'Napellus'	Ranunculaceæ	Britain
Aconiti Radix	,, ,,	,,	,,
Aconitina	,, ,,	,,	,,
Adeps Lanæ	Ovis Aries	Ungulata	Domesticated everywhere
Adeps	Sus Scrofa	,,	,, ,,
Adhatoda	Adhatoda Vasica (Justicia *Adhatoda*)	Acanthaceæ	India
Agropyrum	Agropyrum repens	Graminaceæ	Europe, North America, and Asia
Ajowan Oleum	Carum Copticum	Umbelliferæ (Apiaceæ)	India, Egypt and Persia
Aloe Barbadensis	Aloe Chinensis, A. vera, and probably other species	Liliaceæ	Dutch West Indian Islands and Barbados
Aloe Socotrina	Aloe Perryi and probably other species	,,	Socotra (shipped by way of Bombay and Zanzibar)
Alstonia	Alstonia scholaris Alstonia constricta	Apocynaceæ ,,	India, the Philippine Islands Australia
Ammoniacum	Dorema Ammoniacum and other species	Umbelliferæ	Persia
Amygdala Amara	Prunus *Amygdalus* (var. amara)	Rosaceæ	South of France, Sicily, and Morocco
Amygdala Dulcis	Prunus *Amygdalus* (var. dulcis)	,,	Spain, Portugal, and South of France
Amygdalæ Oleum	Both of the above	,,	,, ,, ,,
Amylum	Triticum sativum (wheat) Zea 'Mays' (maize) Oryza sativa (rice)	Graminaceæ	Cultivated in various parts of the world
Andrographis	Andrographis paniculata	Acanthaceæ	India, Ceylon, Java
Anethi Fructus	Peucedanum graveolens	Umbelliferæ	England, Middle and Southern Europe
Anisi Fructus	Pimpinella *Anisum*	,,	Central and Southern Europe, etc.
Anisi Oleum	,, ,, Illicium anisatum	,, Magnoliaceæ	Distilled in Europe and in China
Anthemidis Flores	Anthemis nobilis	Compositæ (Asteraceæ)	Britain and Belgium, cultivated
Anthemidis Oleum	,, ,,	,,	Britain and Belgium, and France, etc.
Apomorphinæ Hydrochloridum	Morphina or Codeina	*see* Opium	*see* Opium
Arachis Oleum	Arachis hypogæa	Leguminosæ	Tropical Africa, China, India, etc., cultivated

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Parts used.	Preparations into which it enters.
Dried bark	Decoctum Acaciæ Corticis.
Gum exuded from stem and branches	Mucilago Acaciæ; Pulv. Amygdalæ Co. and Pulv. Tragacanth Co. All Trochisci.
Fresh and dried herb	Extractum Acalyphæ Liquidum, and Succus Acalyphæ.
Fresh leaves and flowering tops	
Dried root	Linimentum, and Tinctura Aconiti, and Aconitina.
Dried root	Unguentum Aconitinæ.
The purified cholesterin-fat of sheep's wool	Adeps Lanæ Hydrosus.
Purified fat of the abdomen	Adeps Benzoatus; Empl. Canthar.; Pilula Phosphori; Unguenta Aconitinæ, Atropinæ, Cocainæ, Hydrargyri, Hydrarg. Nitratis, Iodi, Resinæ, and Veratrinæ.
Fresh and dried leaves	Extractum Adhatodæ Liquidum, Succus Adhatodæ, and Tinctura Adhatodæ.
Dried rhizome	Decoctum Agropyri, and Extractum Agropyri Liquidum.
Distilled from fruit.	
Juice of the leaf evaporated to dryness	Aloin; Decoct. Aloes Co.; Ext. Aloes Barb.; Ext. Coloc. Co.; Pil. Aloes Barb.; Pil. Aloes et Ferri; Pil. Cambogiæ Comp.; Pil. Colocynthidis Co.; Pil. Colocynthidis et Hyoscyami; Tinctura Aloes.
Juice of the leaf evaporated to dryness	Aloin; Ext. Aloes Socotrinæ; Pil. Aloes et Asafetidæ; Pil. Aloes et Myrrhæ; Pil. Aloes Socot.; Pil. Rhei Co.; Tinct. Benzoini Co.
Dried bark	Infusum Alstoniæ, and Tinctura Alstoniæ.
Gum-resinous exudation from the flowering and fruiting stem	Emplastrum Ammoniaci c. Hydrargyro; Emplast. Galbani; Mistura Ammoniaci; Pilula Scillæ Co.; Pil. Ipecac. c. Scillâ.
Ripe seed	Oleum Amygdalæ.
Ripe seed	Oleum Amygdalæ; Pulvis Amygdalæ Compositus; Mistura Amygdalæ.
Expressed oil from seeds	Ol. Phosphoratum; Unguenta Aquæ Rosæ, and Cetacei.
Starch	Glycerinum Amyli; Pulvis Tragacanth. Co.
Dried plant	Infusum Andrographidis, Liquor Andrographidis Concentratus, and Tinctura Andrographidis.
Dried ripe fruit	Aqua Anethi; Oleum Anethi.
Dried ripe fruit	Aqua Anisi; Oleum Anisi.
Oil distilled from fruits	Spiritus Anisi; Tinct. Camph. Co.; Tinct. Opii Ammoniata.
Dried expanded flower-heads or capitula	Extractum and Oleum Anthemidis. The latter is also used in the preparation of the Extract.
Volatile oil	Extractum Anthemidis.
Salt of the alkaloid	Injectio Apomorphinæ Hypodermica.
Expressed oil, without heat.	

B.P. Name.	Obtained from.	Natural Order.	Geographical Source.
Araroba	Andira 'Araroba'	Leguminosæ	Brazil (Bahia)
Areca	Areca Catechu	Palmaceæ	Malayan Archipelago, India, Ceylon and the Philippines
Aristolochia	Aristolochia Indica	Aristolochiaceæ	India and Holland
Armoraciæ Radix	Cochlearia *Armoracia*	Cruciferæ (Brassicaceæ)	Britain, cultivated
Arnicæ Flores	Arnica montana	Compositæ	Mountainous parts of Middle and Southern Europe
Arnicæ Rhizoma	,, ,,	,,	,, ,, ,,
Asafetida	Ferula fœtida, and probably other species	Umbelliferæ	Afghanistan and Persia
Atropina	Belladonnæ Radix or ,, Folia	Solanaceæ	Britain, Germany, Austria, etc.
Aurantii Floris Aqua	Citrus Aurantium var. 'Bigaradia'	Rutaceæ	South of Europe
Aurantii Cortex	,, ,,	,,	,,
Aurantii Cortex Indicus	Citrus Aurantium	,,	India and Ceylon
Azadirachta Indica	Melia *Azadirachta*	Meliaceæ	Southern India, Ceylon
Balsamum Peruvianum	Myroxylon Pereiræ	Leguminosæ	San Salvador, in Central America
Balsamum Tolutanum	Myroxylon *Toluifera*	,,	New Granada C.A.
Bebeeru Cortex	Nectandra Rodiæi	Lauraceæ	Guiana
Belæ Fructus	Ægle Marmelos	Rutaceæ	India
Belladonnæ Folia	Atropa *Belladonna*	Solanaceæ	Britain
Belladonnæ Radix	,, ,,	,,	Britain, Germany, etc.
Benzoinum	Styrax Benzoin and other species	Styraceæ	Siam and Sumatra
Berberidis Cortex	Berberis vulgaris	Berberidaceæ	Britain
Berberis	Berberis aristata	,,	India and Ceylon
Betel	Piper Betle	Piperaceæ	India, Ceylon, etc.
Bryoniæ Radix	Bryonia dioica Bryonia alba	Cucurbitaceæ	England and Central and Southern Europe
Buchu Folia	Barosma betulina	Rutaceæ	Cape Colony S. Africa
Buteæ Gummi	Butea frondosa	Leguminosæ	India
Buteæ Seminum	,, ,,	,,	,,
Cadinum Oleum	Juniperus *Oxycedrus* and other species	Coniferæ (Pinaceæ)	Southern Europe
Caffeina	Camellia *Thea* Coffea Arabica	Camelliaceæ Rubiaceæ	China, Japan, and Upper India Cultivated throughout the Tropics (native of Abyssinia)

Parts used.	Preparations into which it enters.
A substance found in cavities in the trunk of Andira Araroba, freed as much as possible from fragments of wood, dried and powdered	Chrysarobin; of Chrysarobin, Ung. Chrysarobin.
Seeds.	
Dried stem and root	Liquor Aristolochiæ Concentratus, and Tinctura Aristolochiæ.
Fresh root	Spiritus Armoraciæ Compositus.
Dried flower-heads	Tinctura Arnicæ Florum.
Dried rhizome and roots	Tinctura Arnicæ.
Gum-resin	Pil. Aloes et Asafetidæ; Pil. Galbani Co.; Spiritus Ammoniæ Fetidus; Tinctura Asafetidæ.
Alkaloid	Unguentum Atropinæ, Atropinæ Sulphas, Lamellæ Atropinæ and Liquor Atropinæ Sulphatis.
Distilled water of flowers	Syrupus Aurantii Floris, Mistura Olei Ricini, Syrupus Calcii Lactophosphatis.
Dried outer part of the rind	Fresh Peel: Tinctura Aurantii, Vinum Aurant., Syrupus Aurantii, Tinct. Quininæ, Syrupus Aromaticus, and Syrup. Cascara Aromat. Dried Peel: Inf. Aurantii, Inf. Aurantii Comp.; Inf. Gentian. Comp.; Tinct. Cinchon. Comp.; Tinct. Gentian. Comp.; Spirit. Armoraciæ Comp.
The fresh and dried outer part of the rind.	
Dried bark of the stem.	Infusum Azadirachtæ Indicæ, and Tinctura Azadirachtæ.
Balsam, from the trunk.	
Balsum, from the trunk	Mist. Ammoniaci; Syrupus Tolutanus; Tinct. Tolutana; Tinct. Benzoini Co.; Tolu Basis; Troch. Acidi Carbolici; Troch. Morphinæ; Troch. Morphinæ et Ipecacuanhæ.
Dried bark.	
Fresh half-ripe fruit	Extractum Belæ Liquidum.
Fresh leaves and branches	Extract. Belladonnæ Viride; Succus Belladonnæ; Atropina.
Dried root	Atropina; Emplast. Belladonnæ; Extract. Belladonnæ Alcoholicum; Extractum Belladonnæ Liquidum; Linimentum Belladonnæ; Tinct. Belladonnæ; Ung. Belladonnæ; Suppos. Belladonnæ.
Balsamic resin	Acidum Benzoicum; Adeps Benzoatus (and Ointments containing it); Tinct. Benzoini Co.; Ung. Cetacei.
Dried bark	Extractum Berberidis Fluidum, Berberinæ Phosphas.
Dried stem	Liquor Berberidis Concentratus, and Tinctura Berberidis.
Leaves.	
Fresh and dried root	Tinctura Bryoniæ.
Dried leaves	Infusum Buchu, Tinctura Buchu.
Inspissated juice from stem.	
Seeds	Pulveris Buteæ Seminum.
An empyreumatic oily liquid obtained by destructive distillation of the branches and wood	
Alkaloid from leaves of tea or seeds of coffee.	Caffeinæ Citras; Caffeinæ Citras Effervescens.

B.P. Name.	Obtained from.	Natural Order.	Geographical Source.
Cajuputi Oleum	Melaleuca leucadendron	Myrtaceæ	Imported from Batavia and Singapore
Calendulæ Flores	Calendula officinalis	Compositæ	Levant and Southern Europe
Calotropis	Calotropis procera Calotropis gigantea	Asclepiadaceæ	India
Calumbæ Radix	Jateorhiza 'Calumba'	Menispermaceæ	Eastern Africa, between Ibo and the Zambesi
Cambogia	Garcinia Hanburii	Clusiaceæ	Siam
Cambogia Indica	Garcinia Morella	,,	India
Camphora	Cinnamomum *Camphora*	Lauraceæ	China (Formosa) and Japan (purified in Britain and elsewhere)
Canellæ Cortex	Canella alba	Canellaceæ	West Indies
Cannabis Indica	Cannabis sativa	Urticaceæ	India
Cantharis	Cantharis vesicatoria	Coleoptera	Spain, France, Sicily, Hungary, and Southern Russia
Caoutchouc	Hevea Brasiliensis	Euphorbiaceæ	Brazil (Para)
Capsici Fructus	Capsicum minimum	Solanaceæ	Zanzibar, Sierra Leone, etc.
Carbo Ligni	Wood	Various	Britain
Cardamomi Semina	Elettaria *Cardamomum*	Scitaminaceæ	India and Ceylon
Carrageen	Chondrus crispus	Algæ (Gigartinaceæ)	North Cape to Gibraltar Eastern Coasts of N. America
Carui Fructus	Carum Carvi	Umbelliferæ	Europe
Carui Oleum	,, ,,	,,	Central and Northern Europe
Caryophylli Oleum	Eugenia caryophyllata	Myrtaceæ	Molucca Islands, Zanzibar, and Pemba
Caryophyllum	,, ,,	,,	Zanzibar, Penang, Bencoolen, etc.
Cascara Sagrada	Rhamnus Purshianus	Rhamnaceæ	California
Cascarilla	Croton *Eluteria*	Euphorbiaceæ	Bahama Islands
Cassiæ Pulpa	Cassia fistula	Leguminosæ	East and West Indies
Castoreum	Castor Fiber	Rodentia	Siberia and Canada
Catechu	Uncaria 'Gambier'	Rubiaceæ	Singapore, and other places in the Eastern Archipelago
Catechu Nigrum (Pegu Catechu and Cutch)	Acacia Catechu	Leguminosæ	India and Burma
Cera Alba	Apis mellifica	Hymenoptera	Britain
Cera Flava	,, ,,	,,	Britain, etc.
Cetaceum	Physeter macrocephalus	Cetacea	Pacific and Indian Oceans
Cetraria	Cetraria Islandica	Discomycetes or Discolichenes	North of Europe

Parts used.	Preparations into which it enters.
Volatile oil distilled from the leaves	Spiritus Cajuputi, Lin. Crotonis.
Dried florets	Tinctura Calendulæ Florum.
Dried root-bark	Tinctura Calotropis.
Dried transversely cut slices of the root	Infusum, Liquor Calumbæ Concentratus, and Tinct. Calumbæ.
Gum-resin	Pilula Cambogiæ Composita.
Gum-resin	
A white crystalline substance obtained from the wood.	Aqua Camph.; Linimenta Aconiti, Belladonnæ, Camph., Camph. Ammoniatum, Chloroformi, Hydrargyri, Opii, Saponis, Sinapis, Terebinthinæ, and Tereb. Aceticum; Spiritus Camph.; Tinct. Camph. Co.; Ung. Hydrarg. Co.
Dried bark	
Dried flowering or fruiting tops of female plants	Extractum Cannabis Ind.; Tinctura Cannab. Ind.; Tinct. Chlorof. et Morphinæ Comp.
The dried beetle.	Acetum, Emplastrum, Tinctura and Unguentum Cantharidis; Collodium Vesicans; Liquor Epispast.; Emplast. Calefaciens.
Prepared milk juice	Liquor Caoutchouc, Charta Sinapis.
Dried ripe fruit	Tinctura Capsici; Tinct. Chlorof. et Morphinæ Comp.; Ung. Capsici.
Carbonaceous residue from wood.	
The dried ripe seeds	Tinct. Cardam. Co.; Ext. Coloc. Co.; Pulv. Cinnam. Co.; Pulv. Cretæ Arom.; Tinct. Gentian. Co.; Tinct. Rhei Co.; Decoct. Aloes Comp.; Mist. Sennæ Comp.
Dried seaweed	Saccharum, and Gelatina Carrageen.
Dried fruit	Aqua and Oleum Carui; Conf. Piperis; Pulvis Opii Compositus; Tinct. Cardam. Co.; Tinci. Sennæ Co.; Pil Aloes Barb.
Volatile oil	Pilula Aloes Barbadensis.
Volatile oil	Pilula Colocynthidis, Composita, Pilula Colocynthidis et Hyoscyami.
Dried flower-buds	Infusum and Oleum Caryophylli; Inf. Aurant. Co.; Pulv. Cretæ Aromat.; Pil. Coloc. Co.; Pil. Coloc. et Hyoscyami.
Dried bark	Ext. Cascaræ Sagradæ; Ext. Cascar. Sagrad. Liquid.; Syrup. Cascaræ Aromaticus.
Dried bark	Infusum and Tinctura Cascarillæ.
Pulp from the pods	Confectio Sennæ.
Dried preputial follicles and secretion	Tinctura Castorei.
An extract of the leaves and young shoots	Infusum Catechu, Pulvis Catechu Comp., Tinctura Catechu, Trochiscus Catechu.
Extract from the wood	Pulvis Catechu Compositus, Tinctura Catechu, Trochiscus Catechu.
Honeycomb; wax, bleached	Pilula Phosphori, Suppositoria Acidi Carbolici, Unguentum Aqua Rosæ, and Unguentum Cetacei.
Honeycomb	Emplast. Calefaciens, Cantharidis, Picis; Unguenta Hydrarg. Co., Menthol, Picis Liquid., Resinæ, and Staphisagriæ. Cera Alba:—Pilula Phosphori, Suppos. Acidi Carbolici, Ung. Aquæ Rosæ, Ung. Cetacei.
A concrete fatty substance, mixed with oil, obtained from the head of the sperm whale, purified	Unguentum Cetacei, Ung. Aquæ Rosæ and Ung. Capsici.
Dried lichen	Decoctum Cetrariæ, Saccharum Cetrariæ, Gelatina Cetrariæ.

B.P. Name.	Obtained from.	Natural Order.	Geographical Source.
Chirata	Swertia 'Chirata'	Gentianaceæ	Northern India
Chrysarobinum	*See* Araroba.		
Cimicifugæ Rhizoma	Cimicifuga racemosa	Ranunculaceæ	Canada and U.S.
Cinchonæ Flav. Cortex	Cinchona Calisaya	Rubiaceæ	Bolivia, Southern Peru, and India
Cinchonæ lancifoliæ Cortex	Cinchona lancifolia	,,	New Granada
Cinchonæ Rubræ Cortex	Cinchona succirubra	,,	South America, cultivated in East Indies, Ceylon, Java, etc.
Cinnamomi Cortex	Cinnamomum Zeylanicum	Lauraceæ	Ceylon
Cinnamomi Oleum	,, ,,	,,	,,
Cissampelos	Cissampelos 'Pareira'	Menispermaceæ	India, East and West Indies, and South Central America
Cocæ Folia	Erythroxylon 'Coca'	Linaceæ	Peru, Java, and Bolivia
Cocainæ Hydrochloridum	,, ,,	,,	,, ,,
Coccus	Coccus Cacti	Hemiptera	Mexico and Teneriffe
Colchici Cormus	Colchicum autumnale	Liliaceæ	Indigenous
Colchici Semina	,, ,,	,,	,,
Colocynthidis Pulpa	Citrullus *Colocynthis*	Cucurbitaceæ	Northern Africa, Syria, and Spain
Condurango	Gonolobus 'Condurango'	Asclepiadaceæ	Ecuador
Conii Folia	Conium maculatum	Umbelliferæ	Britain
Conii Fructus	,, ,,	,,	,,
Copaiba	Copaifera Lansdorfii and other species	Leguminosæ	Valley of the Amazon, etc.
Copaibæ Oleum	,, ,,	,,	,, ,, ,,
Coriandri Fructus	Coriandrum sativum	Umbelliferæ	Germany and Britain, etc.
Coriandri Oleum	,, ,,	,,	,, ,, ,, ,,
Coscinium	Coscinium fenestratum	Menispermaceæ	Ceylon and Southern India.
Coto	Botanical source uncertain	Lauraceæ ?	New Granada
Crocus	Crocus sativus	Iridaceæ	Spain and France, etc.
Crotonis Oleum	Croton *Tiglium*	Euphorbiaceæ	Hindostan, Ceylon, and Indian Archipelago
Cubebæ Fructus	Piper *Cubeba*	Piperaceæ	Java
Cucurbitæ Semina Præparata	Cucurbita maxima (Cucurbita Pepo)	Cucurbitaceæ	Italy, West Indies, Burma, and South America, cultivated
Curara	Strychnos toxifera, etc.	Loganiaceæ	South America
Cuspariæ Cortex	Cusparia febrifuga	Rutaceæ	Tropical South America
Cusso	Brayera anthelmintica	Rosaceæ	Abyssinia
Cydonium	Pyrus *Cydonia*	,,	Western Asia and Europe
Damiana	Turnera aphrodisiaca, etc.	Turneraceæ	Mexico and California

Parts used.	Preparations into which it enters.
Dried plant	Infusum, Liquor Chiratæ Concentratus, and Tinctura Chiratæ.
Dried rhizome and roots	Ext. Cimicifugæ Liquid.; Tinct. Cimicifugæ.
Dried bark	Used in the preparation of the official Salts of Quinine.
Dried bark	Its use is permitted for the manufacture of the official Salts of Quinine.
Dried bark of stem and branches of cultivated plants	Ext. Cinchon. Liquid.; Inf. Cinchon. Acid.; Tinct. Cinchonæ; Tinct. Cinchon. Comp.; Quinine.
The dried inner bark of shoots from the truncated stocks	Aqua, Oleum, Pulvis Co., and Tinct. Cinnamomi; Pulvis Catechu Comp. Tinct. Catechu; Decoct. Hæmatoxyli; Pulv. Cretæ Arom.; Pulv. Kino Co.; Tinct. Cardam. Co.; Tinct. Lavand. Co.; of the Water, Mist. Cretæ, Mist. Guaiaci, Mist. Olei Ricini, Mist. Spiritus Vin. Gallici, Syrupus Aromaticus and Syrupus Cascaræ Aromaticus.
Volatile oil from bark	Spiritus Cinnamomi; of the Compound Powder, Pil. Aloes et Ferri, and Pil. Cambogiæ Composita; of the Spirit, Acidum Sulphuricum Aromaticum.
Dried root	Decoctum Cissampeli, and Extractum Cissampeli Liquidum.
Dried leaves	Ext. Cocæ Liquid.; Cocainæ Hydrochloridum; Cocaine.
Salt of the alkaloid	Lamellæ Cocainæ and Injectio Cocainæ Hypodermica.
Dried fecundated female insect	Tinctura Cocci; Tinct. Cardam. Co.; Tinct. Cinchonæ Co.
Fresh corm dried	Extractum and Vinum Colchici.
Dried ripe seeds	Tinctura Colchici Seminum.
Dried pulp of the fruit freed from seeds	Extractum Coloc. Co.; Pil. Coloc. Co.; Pil. Coloc. et Hyoscyam.
Dried bark.	
Fresh leaves and young branches	Succus Conii; Unguentum Conii (from Succus).
Dried full-grown unripe fruits	Tinctura Conii.
Oleo-resin from the trunk	Oleum Copaibæ.
Distilled oil from oleo-resin.	
Dried ripe fruit	Oleum Coriandri; Conf. Sennæ; Syrupus Rhei et Tinct. Rhei Co.; Syrupus Sennæ et Tinct. Sennæ Co.
Volatile oil.	
Dried stem	Infusum Coscinii, Liquor Coscinii Concentratus, and Tinctura Coscinii.
Bark.	
The dried stigmas and tops of the styles	Tinctura Croci; Decoct. Aloes Co.; Tinct. Cinchon. Co.
Expressed oil from the seeds	Linimentum Crotonis.
Dried full-grown unripe fruits.	Oleum Cubebæ; Tinctura Cubebæ.
Fresh ripe seeds.	
Extract from plant.	
Dried bark	Infusum Cuspariæ, and Liquor Cuspariæ Concentratus.
Dried panicles of pistillate flowers.	
Seeds.	
Leaves.	

B.P. Name.	Obtained from.	Natural Order.	Geographical Source.
Daturæ Folia	Datura fastuosa var. alba Datura Metel	Solanaceæ	India
Daturæ Semina	Datura fastuosa var. alba	,,	,,
Digitalis Folia	Digitalis purpurea	Scrophulariaceæ	Britain
Elaterium	Ecballium *Elaterium*	Cucurbitaceæ	Britain (cultivated), Malta
Elemi	Canarium commune and other species	Burseraceæ	Manila, Brazil, and Mexico
Embelia	Embelia ribes, Embelia robusta	Myrsinaceæ	India and East Indies
Ergota	Secale cereale	Graminaceæ	Europe and the Canaries
Erythrophlœum	Erythrophlœum Guineense	Leguminosæ	Western Africa
Eucalypti Oleum	Eucalyptus globulus, and other species	Myrtaceæ	Australia, etc.
Eucalypti Gummi	Eucalyptus rostrata and other species	,,	,, ,,
Euonymi Cortex	Euonymus atropurpureus	Celastraceæ	United States
Euphorbia pilulifera	Euphorbia pilulifera	Euphorbiaceæ	Queensland and Tropical America
Euphorbium	Euphorbia resinifera	,,	Morocco
Fel Bovinum Purificatum	Bos Taurus	Ungulata	Domesticated everywhere
Ficus	Ficus Carica	Urticaceæ	Smyrna
Filix-Mas	Aspidium *Filix-mas*	Filices	Britain
Fœniculi Fructus	Fœniculum capillaceum	Umbelliferæ	Central and Southern Europe, also India and Japan, etc.
Fucus	Fucus vesiculosus	Algæ (Fucaceæ)	Britain
Galbanum	Ferula galbaniflua and probably other species	Umbelliferæ	Persia
Galla	Quercus infectoria	Cupuliferæ (Corylaceæ)	Asia Minor
Gaultheriæ Oleum	Gaultheria procumbens (leaves) Betula lenta (bark)	Ericaceæ Betulaceæ	United States and Canada
Gelsemii Radix	Gelsemium nitidum	Loganiaceæ	Southern part of the United States of America
Gentianæ Radix	Gentiana lutea	Gentianaceæ	Central and Southern Europe (mountains)
Glycyrrhizæ Radix	Glycyrrhiza glabra and other species	Leguminosæ	England, France, Spain, Sicily, Russia, and Persia
Gossypii Radicis Cortex	Gossypium herbaceum	Malvaceæ	Imported from the United States
Gossypium	Gossypium Barbadense and other species	,,	Warm and Tropical regions
Graminis Citrati Oleum	Andropogon citratus	Graminaceæ	India, Malay Peninsula, Ceylon, etc. (cultivated)
Granati Cortex	Punica Granatum	~~Lythraceæ~~	Shores of the Mediterranean and Central Asia
Grindelia	Grindelia camporum	Compositæ	Southern part of the United States of America
Guaiaci Lignum	Guaiacum officinale or Guaiacum sanctum	Zygophyllaceæ	St. Domingo and Jamaica
Guaiaci Resina			

Parts used.	Preparations into which it enters.
Dried leaves.	
Dried seeds	Tinctura Daturæ Seminum.
Dried leaves	Infusum and Tinctura Digitalis.
Nearly ripe fruit	Elaterinum, Pulvis Elaterini Compositus.
Oleo-resinous exudation.	
Fruit.	
The sclerotium of *Claviceps purpurea*, originating in the ovary of *Secale cereale*	Extractum Ergotæ, Extractum Ergotæ Liquidum, Infusum Ergotæ, and Tinctura Ergotæ Ammoniata, Ergotinum, Inject. Ergotæ Hypoderm.
Bark.	
Distilled oil from the fresh leaves	Unguentum Eucalypti.
A ruby-coloured exudation	Trochiscus Eucalypti Gummi.
Dried root bark	Extractum Euonymi Siccum.
Dried herb.	
Concrete resinous juice.	
The purified ox bile.	
Dried fleshy receptacles	Confectio Sennæ.
Dried rhizome	Extractum Filicis Liquidum.
Dried ripe fruit	Aqua Fœniculi; Pulv. Glycyrrhizæ Co.
Dried seaweed.	
Gum-resin	Pil. Galbani Co
Excrescences caused by the punctures and deposition of an egg or eggs of *Cynips Gallæ tinctoriæ*	Acidum Gallicum and Tannicum; Tinct. Gallæ, Ung. Gallæ, and Ung. Gallæ c. Opio.
Distilled oil.	
Dried rhizome and roots	Tinct. Gelsemii.
Dried rhizome and roots	Extractum, Infusum Co., and Tinct. Gentianæ Co.
The peeled root and peeled subterranean stem	Extract., Ext. Liquid., Liquor Sarsæ Comp. Conc., and Pulv. Gycyrrh. Co.; Pil. Hydr. Of the Extract, Conf. Sennæ, and Decoct. Aloes Comp. Of the Liquid Extract, Mistura Sennæ Comp., and Tinctura Aloes.
Dried root-bark	Decoctum Gossypii Radicis Corticis, and Extractum Radicis Corticis Liquidum.
Hairs of the seed	Pyroxylin.
Distilled oil: 'Oil of Verbena.'	
Dried bark of the stem and root	Decoctum Granati Corticis.
Dried leaves and flowering tops	Extractum Grindeliæ Liquidum.
Heart-wood	Liquor Sarsæ Compositus Concentratus.
Resin from the stem	Mist. Guaiaci; Pil. Hydrarg. Subchlor. Co., Tinct. Guaiaci Ammon.; Trochiscus Guaiaci Resinæ.

B.P. Name.	Obtained from.	Natural Order.	Geographical Source.
Gummi Indicum	Anogeissus latifolia	Combretaceæ	India and Ceylon
Gynocardiæ Oleum	Taraktogenos Kurzii	Bixaceæ	Malay Peninsula and Eastern India
Hæmatoxyli Lignum	Hæmatoxylon Campechianum	Leguminosæ	Campeachy, Honduras, and Jamaica
Hamamelidis Cortex	Hamamelis Virginiana	Hamamelidaceæ	United States and Canada
Hamamelidis Folia	,, ,,	,,	,, ,,
Hemidesmi Radix	Hemidesmus Indicus	Asclepiadaceæ	India and Ceylon
Hirudo	Sanguisuga medicinalis (speckled) Sanguisuga officinalis (green)	Hirudinea	Spain, France, Italy, Hungary
Hirudo Australis	Hirudo quinquestriata (Limnobdella quinquestriata)	,,	Australia
Hydrastis Rhizoma	Hydrastis Canadensis	Ranunculaceæ	United States and Canada
Hygrophila	Hygrophila spinosa	Acanthaceæ	India
Hyoscyami Folia	Hyoscyamus niger	Solanaceæ	Britain and Germany, etc.
Ignatia amara	Strychnos Ignatii	Loganiaceæ	Philippines
Ipecacuanhæ Radix	Psychotria *Ipecacuanha*	Rubiaceæ	Brazil and Selangor
Iris	Iris versicolor	Iridaceæ	United States
Ispaghula	Plantago ovata	Plantaginaceæ	India and Persia
Jaborandi Folia	Pilocarpus 'Jaborandi'	Rutaceæ	Brazil (Pernambuco)
Jalapa	Ipomœa 'Purga'	Convolvulaceæ	Mexico (cultivated in Jamaica and India)
Juniperi Oleum	Juniperus communis	Coniferæ	North of Europe, indigenous
Kaladana	Ipomœa hederacea	Convolvulaceæ	India and Persia
Kamala	Mallotus Philippinensis	Euphorbiaceæ	Ceylon, the Philippines, China, Australia, etc.
Kavæ Rhizoma	Piper *Methysticum*	Piperaceæ	Sandwich Islands
Kino	Pterocarpus marsupium	Leguminosæ	Malabar
Kino Eucalypti	Eucalyptus calophylla, etc.	Myrtaceæ	Western Australia
Kola	Cola acuminata	Sterculiaceæ	West Coast of Africa
Krameriæ Radix	Krameria triandra (Peruvian) Krameria argentea (Pará)	Polygalaceæ	Peru and Brazil
Lactuca	Lactuca virosa	Compositæ	Western, Central and Southern Europe and Britain
Laricis Cortex	Larix Europæa	Coniferæ	England, Southern and Central Europe
Laurocerasi Folia	Prunus *Laurocerasus*	Rosaceæ	Britain, cultivated
Lavandulæ Oleum	Lavandula vera	Labiatæ (Lamiaceæ)	England, cultivated (also the Western shores of the Mediterranean)

Parts used.	Preparations into which it enters.
Gummy exudation from the wood	Mucilago Gummi Indici.
Fatty oil expressed from seeds	Unguentum Gynocardiæ.
Heart-wood	Decoctum Hæmatoxyli.
Dried bark	Tinctura Hamamelidis.
Leaves, fresh and dried	Of the Dried Leaves, Extractum Hamamelidis Liquidum; Unguentum Hamamelidis (from Liquid Extract). Of the Fresh Leaves, Liquor Hamamelidis.
Dried root	Syrupus Hemidesmi.
Leech (annelid).	
Leech (annelid).	
Dried rhizome and roots	Extractum Hydrastis Liquidum, Tinctura Hydrastis.
Dried herb including the root.	Decoctum Hygrophilæ.
Fresh leaves and flowers, with branches	Extractum Viride, Succus, and Pil. Coloc. et Hyoscyam.
Dried leaves and flowering tops	Tinctura Hyoscyami; Hyoscyin. Hydrobrom.; Hyoscyamine Sulphas.
Seeds (dried).	
Dried root	Acetum Ipecac.; Pil. Ipecac. c. Scillâ; Pulv. Ipecac. Co.; Trochiscus Ipecac.; Trochiscus Morphinæ et Ipecac.; Vinum Ipecac.; Extractum Ipecacuanhæ Liquidum.
Rhizome and roots	
Dried seeds	Decoctum Ispaghulæ.
Dried leaflets	Extract. Liquidum, and Tinct. Jaborandi; Pilocarpinæ Nitras.
Dried tubercles	Extractum, Pulv. Co., Resina, and Tinctura Jalapæ; Pilula Scammonii Composita; Pulvis Scammonii Comp.
Oil from the full-grown unripe green fruit.	Spiritus Juniperi, and Misturi Creosoti.
Dried seeds	Pulvis Kaladanæ Compositus, Resina Kaladanæ, and Tinctura Kaladanæ.
Minute glands and hairs from the fruits.	
Rhizome without the roots	Extractum Kavæ Liquidum.
Juice from the trunk evaporated to dryness	Pulvis Compositus, Tinct. Kino; Pulv. Catechu Co.
Exudation from the stem.	
The seeds.	
Dried root	Extractum, Infusum, Tinctura Krameriæ; Pulv. Catechu Co.; Liquor Krameriæ Concentratus; Troch. Krameriæ; Troch. Krameriæ et Cocainæ.
Fresh herb.	
Bark (dried).	
Fresh leaves	Aqua Laurocerasi.
Distilled oil from flowers	Spiritus and Tinctura Lavandulæ Comp.; Lin. Camph. Ammoniatum; Tinct. Lavand. Comp. is contained in Liquor Arsenicalis.

B.P. Name.	Obtained from.	Natural Order.	Geographical Source.
Limonis Cortex	Citrus medica var. 'Limonum'	Rutaceæ	South of Europe
Limonis Succus	,, ,,	,,	,, ,, and West Indies
Linum	Linum usitatissimum	Linaceæ	Britain, Holland, Russia, etc.
Lobelia	Lobelia inflata	Campanulaceæ	North America
Lupulinum	Humulus *Lupulus*	Urticaceæ	England, imported from Europe, United States, and Canada
Lupulus	,, ,,	,,	,, ,, ,,
Lycopodium	Lycopodium clavatum and other species	Lycopodiaceæ	Great Britain, Central and Northern Europe, etc.
Manna	Fraxinus Ornus	Oleaceæ	Sicily and Calabria
Mastiche	Pistacia Lentiscus	Anacardiaceæ	The Island of Scio
Matico	Piper angustifolium	Piperaceæ	Peru, etc.
Mel Depuratum	Apis mellifica	Hymenoptera	Universally domesticated
Menthæ piperitæ Oleum	Mentha piperita	Labiatæ	Britain and the United States, etc.
Menthæ viridis Oleum	Mentha viridis	,,	Britain and Germany, etc.
Menthol	Mentha arvensis vars. piperascens and glabrata Mentha piperita	,,	China and Japan United States
Mezerei Cortex	Daphne Mezereum *Laureola* Gnidium	Thymelæaceæ	Mountainous parts of Europe
Morphinæ Acetas	Opium	*see* Opium	*see* Opium
Morphinæ Hydrochloridum	,,	,,	,,
Morphinæ Tartras	,,	,,	,,
Morrhuæ Oleum	Gadus *Morrhua*	Teleostei	Coasts of Norway, France, and England, Newfoundland and Labrador
Moschus	Moschus moschiferus	Ungulata	Native of Central Asia; imported from China
Mylabris	Mylabris phalerata and M. Cichorii	Coleoptera	China, Southern Europe, and India
Myristica	Myristica fragrans	Myristicaceæ	Banda Islands of the Malayan Archipelago and Sumatra, etc.
Myristicæ Oleum	,, ,,	,,	,, ,,
Myrobalanum	Terminalia Chebula	Combretaceæ	East Indies
Myrrha	Balsamodendron Myrrha and probably other species	Burseraceæ	Somaliland and Arabia Felix
Nux Vomica	Strychnos Nux-vomica	Loganiaceæ	East Indies, imported from India, Ceylon, and Cochin China

Parts used.	Preparations into which it enters.
Fresh outer part of the pericarp of the fruit	Oleum, Syrupus, Tinctura Limonis; Inf. Aurant. Co.; Inf. Gentian. Co. The Oil is contained in Lin. Pot. Iodid. c. Sapone, Spir. Amm. Aromat., Tinct. Guaiac. Amm. and Tinct. Valer. Amm.
Freshly expressed juice of the ripe fruit	Syrupus Limonis, Acidum Citricum.
Dried ripe seeds, entire and reduced to a coarse powder.	Linum Contusum, Oleum Lini.
Dried flowering herb . . .	Tinct. Lobeliæ Ætherea.
Glands from the strobiles.	
Dried strobiles	Infusum, Tinctura Lupuli, Lupulinum.
The minute yellow spores.	
Concrete saccharine exudation.	
Concrete resinous exudation.	
Dried leaves.	
Saccharine secretion in honeycomb	Mel Boracis; Oxymel; Oxymel Scillæ; Conf. Piper.
Oil distilled from fresh flowering peppermint	Aqua, and Spiritus Menthæ Piperitæ; Pil. Rhei Co.; Tinct. Chloroformi et Morphinæ Comp.
Oil distilled from fresh flowering spearmint	Aqua Menthæ Viridis.
A crystalline substance obtained by cooling the oil .	Emplastrum Menthol.
Dried bark	Liquor Sarsæ Compositus Concentratus.
Salt of the alkaloid	Liquor Morphinæ Acetatis.
Salt of the alkaloid	Liquor Morph. Hydrochlor., Suppos. Morph., Tinct. Chlorof. et Morph. Comp., Trochiscus Morph., also et Ipecac.
. . . .	Injectio Morphinæ Hypodermica, and Liquor Morphinæ Tartratis.
Oil of fresh liver of the cod.	
Dried secretion from the preputial follicles.	
The dried beetle.	Acetum Mylabridis, Emplastrum Mylabridis, Emplastrum Calefaciens Mylabridis, Liquor Epispasticus Mylabridis, Unguentum Mylabridis.
Dried seed divested of its testa	Oleum, and Oleum Myristicæ Expressum; Pulv. Catechu Co.; Pulv. Cretæ Aromat.; Sp. Armoraciæ Co.; Tinct. Lavand. Co.
Oil distilled from seed . . .	Pil. Aloes Socot., Spir. Ammon. Arom., Spir. Myristicæ; Tinct. Guaiac. Amm. and Tinct. Valer. Amm.; of the Spirit, Mist. Ferri Comp.
Dried immature fruits . . .	Unguentum Myrobalani, Unguentum Myrobalani c. Opio.
Gum-resin (from the stem) .	Tinct. Myrrh.; Pil. Aloes et Myrrh.; Decoct. Aloes Co.; Mist. Ferri Co.; Pil. Galbani Co.; Pil. Rhei Co.
Dried ripe seeds.	Extractum, Extractum Liquidum, and Tinctura Nucis Vomicæ; Strychnina.

B.P. Name.	Obtained from.	Natural Order.	Geographical Source.
Olivæ Oleum	Olea Europæa	Oleaceæ	South of Europe
Oliveri Cortex	Cinnamomum Oliveri	Lauraceæ	Australia, India, Burma, North America, and Southern United States
Opium	Papaver somniferum	Papaveraceæ	Asia Minor (Smyrna, etc.)
Papaveris Capsulæ	,, ,,	,,	Britain and Asia Minor
Pareiræ Radix	Chondrodendron tomentosum	Menispermaceæ	Brazil
Pepsinum	Sus Scrofa Ovis Aries Bos Taurus	Ungulata	Domesticated everywhere
Physostigmatis Semen	Physostigma venenosum	Leguminosæ	Western Africa
Picrorhiza	Picrorhiza 'Kurroa'	Scrophulariaceæ	Northern India
Picrotoxinum	Anamirta paniculata	Menispermaceæ	Eastern India and the Malayan Islands
Pimenta	Pimenta officinalis	Myrtaceæ	Jamaica
Pimentæ Oleum	,, ,,	,,	West Indies, Mexico, and Jamaica, etc.
Pini Oleum	Pinus pumilio	Coniferæ	Mountains of Central Europe
Piper Nigrum	Piper nigrum	Piperaceæ	East Indies
Pix Burgundica	Picea excelsa	Coniferæ	Germany
Pix Liquida	Pinus sylvestris and other species	,,	Scotland, Russia, Denmark, and Norway
Podophylli Indici Rhizoma	Podophyllum Emodi	Berberidaceæ	Indigenous to the Himalayas
Podophylli Rhizoma	Podophyllum peltatum	,,	North America
Pruni Virginianæ Cortex	Prunus serotina	[illegible]	,, ,,
Prunum	Prunus domestica	Rosaceæ	South of France
Pterocarpi Lignum	Pterocarpus santalinus	Leguminosæ	Madras and Ceylon
Pyrethri Flores	Pyrethrum cinerariæfolium, P. roseum and P. carneum	Compositæ	California, Dalmatia, and the Caucasus
Pyrethri Radix	Anacyclus *Pyrethrum*	,,	Algeria
Quassiæ Lignum	Picræna excelsa	Simarubaceæ	Jamaica
Quillaiæ Cortex	Quillaia 'Saponaria'	Rosaceæ	Chili and Peru
Quininæ Hydrochlor	Various species of Cinchona and Remijia	Rubiaceæ	South America, India, Ceylon, and Java
Quininæ Sulphas	,, ,,	,,	,, ,,
Resina	Various species of Pinus	Coniferæ	North America
Rhamni Purshiani Cortex	*See* Cascara Sagrada.		
Rhei Radix	Rheum palmatum, Rheum officinale, and probably other species	Polygonaceæ	China and Tibet
Rhœados Petala	Papaver Rhœas	Papaveraceæ	Britain

Parts used.	Preparations into which it enters.
Expressed oil from the ripe fruit	Emplastra Ammoniac. c. Hydrarg., Hydrarg. Picis, Plumbi, Linimenta Ammoniæ, Calcis, and Camphoræ; Sapo Durus and Mollis; Unguenta Capsici, Hydrarg. Comp., Hydrarg. Nitratis, and Resinæ.
Dried bark	Tinctura Oliveri Corticis.
Inspissated juice from unripe capsules	Preparations many. *Vide* Opium.
Nearly ripe dried fruits.	
Dried root	Extractum Pareiræ Liquidum.
An enzyme from the mucous lining of the fresh and healthy stomach of the pig, sheep or calf	Glycerinum Pepsinæ.
Ripe seeds	Extractum Physostigmatis; Physostigminæ Sulphas, from which is prepared Lamellæ Physostigminæ.
Dried rhizome glucoside . . .	Extractum Picrorhizæ Liquidum, Tinctura Picrorhizæ.
A ~~neutral principle~~ from the fruits.	
Dried full-grown unripe fruit.	Aqua, Oleum Pimentæ.
Volatile oil from unripe fruit.	
Oil distilled from fresh leaves and shoots.	
Dried unripe fruit	Confectio Piperis, Pulv. Opii Co.
Resinous exudation from the stem	Emplastrum Picis.
Bituminous liquid obtained from the wood	Unguentum Picis Liquidæ.
Dried rhizome and roots . .	Resina Podophylli Indici, and from it Tinctura Podophylli Indici.
Dried rhizome and roots . .	Resina Podophylli, and from it Tinctura Podophylli.
The bark	Syrupus and Tinctura Pruni Virginianæ.
Dried ripe fruits.	Confectio Sennæ.
Heart-wood	Tinctura Lavandulæ Composita.
Flower-heads in powder.	
Dried root	Tinctura Pyrethri.
Wood of the trunk and branches	Infusum, Liquor Concentratus and Tinctura Quassiæ.
The inner part of the bark. .	Tinctura Quillaiæ and Liquor Picis Carbonis.
Salt of the alkaloid	Tinctura Quininæ and Vinum Quininæ.
Salt of the alkaloid	Ferri et Quininæ Citras, Tinct. Quininæ Ammon., Pil. Quin. Sulphat., Syrup. Ferri Phosph. c. Quini. et Strych.
The residue left after the distillation of the Oil of Turpentine from the crude oleo-resin	Emplastrum and Unguentum Resinæ. Emplastra Calefaciens, Cantharidis, Menthol, Picis, Plumbi Iodidi, and Saponis.
The erect rhizome, deprived of more or less of its cortex and dried	Extractum Rhei, Infusum Rhei, Liquor Rhei Concentratus, Pilula Rhei Co., Pulvis Rhei Co., Syrupus Rhei, Tinctura Rhei Comp.
Fresh petals	Syrupus Rhœados.

B.P. Name.	Obtained from.	Natural Order.	Geographical Source.
Ricini Oleum	Ricinus communis	Euphorbiaceæ	India
Rosæ Gallicæ Petala	Rosa Gallica	Rosaceæ	Britain and France, cultivated
Rosæ Oleum	Rosa Damascena	,,	Bulgaria, etc.
Rosmarini Oleum	Rosmarinus officinalis	Labiatæ	South of Europe, cultivated in England
Rutæ Oleum	Ruta graveolens	Rutaceæ	England and Southern Europe
Sabinæ Cacumina	Juniperus *Sabina*	Coniferæ	Britain, Southern Europe, etc.
Saccharum Purificatum	Saccharum officinarum	Graminaceæ	West Indies and British Guiana
Saccharum Lactis	Bos Taurus	Ungulata	Domesticated everywhere
Salicinum	From various species of Salix, chiefly Salix fragilis, and Populus	Salicaceæ	Temperate regions of the Northern Hemisphere
Sambuci Flores	Sambucus nigra	Caprifoliaceæ	Britain, Central and Southern Europe
Santali Oleum	Santalum album	Santalaceæ	India
Santoninum	Artemisia maritima, var. Stechmanniana	Compositæ	Asiatic Russia
Sappan	Cæsalpinia Sappan	Leguminosæ	Madras and Malayan Peninsulas
Sarsæ Radix	Smilax ornata	Liliaceæ	Costa Rica and South America
Sassafras Radix	Sassafras officinale	Lauraceæ	North America
Scammoniæ Radix	Convolvulus Scammonia	Convolvulaceæ	Syria and Asia Minor
Scammoniæ Resina	,, ,,	,,	,, ,, ,,
Scammonium	,, ,,	,,	Chiefly from Smyrna, in Asia Minor
Scilla	Urginea *Scilla*	Liliaceæ	Mediterranean coasts
Scoparii Cacumina	Cytisus Scoparius	Leguminosæ	Britain
Senegæ Radix	Polygala *Senega*	Polygalaceæ	North America
Senna Alexandrina	Cassia acutifolia	Leguminosæ	Soudan, imported from Alexandria
Senna Indica	Cassia angustifolia	,,	Southern India and Arabia
Serpentariæ Rhizoma	Aristolochia Serpentaria or Aristolochia reticulata	Aristolochiaceæ	Southern parts of North America
Sesami Oleum	Sesamum Indicum	Pedaliaceæ	Indigenous to India, cultivated in Turkey and Greece
Sevum Præparatum	Ovis Aries	Ungulata	Domesticated everywhere
Sinapis	Brassica alba nigra	Cruciferæ	Britain
Staphisagriæ Semina	Delphinium *Staphisagria*	Ranunculaceæ	South of Europe
Stramonii Folia	Datura *Stramonium*	Solanaceæ	Britain, cultivated
Stramonii Semina	,, ,,	,,	,, ,,
Strophanthi Semina	Strophanthus 'Kombé'	Apocynaceæ	East Africa
Strychnina	Strychnos Nux vomica and other species of Strychnos	Loganiaceæ	East Indies and Philippines

Parts used.	Preparations into which it enters.
Oil expressed from the seeds	Collodium Flexile, Lin. Sinapis, Mistura Olei Ricini, Pil. Hydrarg. Subchlor. Co.
Fresh and dried unexpanded petals	Confectio Rosæ Gallicæ, Syrupus Rosæ, Infusum Rosæ Acidum. Of the Confection, Pilulæ Aloes Barb., Aloes et Asafetidæ, Aloes Socot., and Hydrarg.
Oil distilled from fresh flowers	Unguentum Aqua Rosæ.
Oil distilled from the flowering tops	Spiritus Rosmarini; Lin. Saponis and Tinct. Lavand. Comp.
Volatile oil distilled from fresh herb.	
Fresh and dried tops.	
Juice of the sugar-cane	All Syrups and Lozenges, and several other preparations.
Whey of milk, evaporated	Pulv. Elaterini Comp., Extract. Bellad. Alcohol., Nucis Vom., Physostigmatis, and Strophanthi.
Crystalline glucoside obtained from the bark.	
Flowers separated from stalks	Aqua Sambuci.
Oil distilled from the wood.	
A crystalline principle	Trochiscus Santonini.
Heart-wood	Decoctum Sappan.
Dried root	Extractum Sarsæ Liquidum, and Liquor Sarsæ Compositus Concentratus.
Dried root	Liquor Sarsæ Compositus Concentratus.
Dried root	Resina Scammoniæ.
Resin from root	Pil. Scam. Co.; Pulv. Scam. Co.; Ext. Col. Co.; Pil. Col. Co.; Pil. Col. et Hyoscyam.
Gum-resin obtained from living root.	
Sliced and dried bulb	Acetum, Oxymel, Pilula Co., Syrupus and Tinctura Scillæ; Pil. Ipecac. c. Scillâ.
Fresh and dried tops	Infusum Scoparii (from dried); Succus Scoparii (from fresh).
Dried root	Infusum and Tinctura Senegæ, Liquor Senegæ Concentratus.
Dried leaflets	Confectio, Infusum, Mistura Co., Syrupus, and Tinctura Sennæ; Pulvis Glycyrrhizæ Compositus, Liquor Sennæ Concentratus.
Dried leaflets	May be used in the place of Alexandrian Senna.
Dried rhizome and roots	Infusum, Liquor Serpentariæ Concentratus, and Tinctura Serpentariæ; Tinct. Cinchon. Co.
Oil expressed from seeds.	
Internal fat of the abdomen	Unguentum Hydrargyri.
Dried ripe seeds of both, powdered and mixed	Charta Sinapis, Oleum Sinapis Volatile (from Black Mustard only); Lin. Sinapis from the Oil.
Dried ripe seeds	Unguentum Staphisagriæ.
Dried leaves	Tinctura Stramonii.
Dried ripe seeds	Extractum Stramonii.
Dried ripe seeds freed from awns	Tinctura Strophanthi and Extractum Strophanthi.
The alkaloid.	

B.P. Name.	Obtained from.	Natural Order.	Geographical Source.
Styrax præparatus	Liquidambar orientalis	Hamamelidaceæ	South-west of Asia Minor
Succinum	Pinites succinifer	Coniferæ	Shores of the Baltic
Sumbul Radix	Ferula 'Sumbul'	Umbelliferæ	Asiatic Russia
Tabaci Folia	Nicotiana *Tabacum*	Solanaceæ	America
Tamarindus	Tamarindus Indica	Leguminosæ	West Indies
Taraxaci Radix	Taraxacum officinale	Compositæ	Britain
Terebinthina Canadensis	Abies balsamea	Coniferæ	Canada
Terebinthinæ Oleum	Pinus Tæda, palustris, and other species	,,	United States of America
Theobromatis Oleum	Theobroma *Cacao*	Sterculiaceæ	Central America
Thus Americanum	Pinus Tæda palustris	Coniferæ	Southern States of North America
Thymol	Thymus vulgaris Monarda punctata Carum Copticum	Labiatæ Umbelliferæ	Manufactured in Britain
Thyroideum Siccum	Ovis Aries	Ungulata	. . . .
Tinospora	Tinospora cordifolia	Menispermaceæ	Tropical India
Toddalia	Toddalia aculeata	Rutaceæ	Madras Peninsula
Tragacantha	Astragalus gummifer	Leguminosæ	Asia Minor and Persia
Turpethum	Ipomœa Turpethum	Convolvulaceæ	India and Ceylon
Tylophoræ Folia	Tylophora asthmatica	Asclepiadaceæ	Bengal, Madras Peninsula and other parts of India, and Ceylon
Ulmi Cortex	Ulmus campestris	Urticaceæ	Central and Southern Europe, and England
Urginea	Urginea Indica and Scilla Indica	Liliaceæ	India
Uvæ Ursi Folia	Arctostaphylos Uva-ursi	Ericaceæ	Britain
Valerianæ Indicæ Rhizoma	Valeriana Wallichii	Valerianaceæ	Himalayas
Valerianæ Rhizoma	Valeriana officinalis	,,	Britain and Europe
Vanilla	Vanilla planifolia	Orchidaceæ	Mexico and Bourbon
Veratri Viridis Rhizoma	Veratrum viride	Liliaceæ	United States and Canada
Veratrina	Schœnocaulon officinale	,,	Mexico
Viburnum	Viburnum prunifolium	Caprifoliaceæ	Middle and Southern United States
Zingiber	Zingiber officinale	Scitaminaceæ	West Indies, India, and Cochin China

In these Tables, Bentham and Hooker's *Genera Plantarum* has been followed
ing the names of the botanical sources of the drugs have been made, with the view of
name is derived from the vernacular name ; italics indicate that the name has
is derived from a proper name, or from an old popular or commercial name.
recommended by Engler, and in the few names without this termination that have
been given in parentheses in the first instance where such natural orders occur.

Parts used.	Preparations into which it enters.
Balsam from the trunk purified	Tinctura Benzoini Composita.
Fossil resinous exudation.	
Dried transverse slices of the root	Tinctura Sumbul.
Dried leaves.	
Fruits freed from the brittle outer part of the pericarp	Confectio Sennæ.
Fresh and dried roots	Extractum, Extractum Liquidum, Succus Taraxaci.
The oleo-resin	Collodium Flexile.
Oil distilled from turpentine	Linimentum, Linimentum Aceticum, and Terebenum.
Concrete oil from warm crushed seeds	All Suppositories except Glycerin.
Concrete oleo-resin	Emplastrum Picis.
A crystalline substance from the oils.	
Fresh and healthy thyroid gland	Liquor Thyroidei.
Dried stem	Infusum Tinosporæ, Liquor Tinosporæ Concentratus, Tinctura Tinosporæ.
Dried root-bark	Infusum Toddaliæ, Liquor Toddaliæ Concentratus.
Gummy exudation	Mucilago, Glycerinum, Pulv. Tragac. Co.; Conf. Sulphuris; Pulv. Opii Co.; Mist. Cretæ and Guaiaci; Pil. Quinin. Sulph.; of the Mucilage, Lotio Hydrarg. Nigra.
Dried root and stem.	
Dried leaves.	
Dried inner bark.	
Younger bulbs	Pilulæ Ipecacuanhæ c. Urginea, Acetum Urgineæ, Oxymel Urgineæ, Pilula Urgineæ Composita, Syrupus Urgineæ, and Tinctura Urgineæ.
Dried leaves	Infusum Uvæ Ursi.
Dried rhizome and rootlets	Tinctura Valerianæ Indicæ Ammoniata.
Dried erect rhizome and roots	Tinctura Valerianæ Ammoniata.
Dried fruit.	
Dried rhizome and rootlets.	
The alkaloid from cevadilla	Unguentum Veratrinæ.
Dried bark	Extractum Viburni Prunifolii Liquidum.
Scraped and dried rhizome	Syrupus and Tinctura, Zingiberis. It is also used in some powders and other preparations.

with respect to botanical classification, and some alterations in the method of print-
making the Table more useful to students, thus: quotation marks imply that the
previously been used as a generic name; and an initial capital letter that the name
The names of the natural orders have been used with the termination *aceæ* as
been retained, the name recommended by Lindley, for the sake of uniformity, has

A TABULATED COMPARISON OF THE CHIEF STANDARDISED POTENT PREPARATIONS OF THE BRITISH, UNITED STATES, GERMAN AND FRENCH (1908) PHARMACOPŒIAS.

—	B.P.		U.S.P.		P.G. IV.		FRENCH CODEX 1908.
	STANDARD.	DOSE.	STANDARD.	DOSE.	STANDARD.	DOSE.	
Aconite Root	..	..	Not less than 0·5 p.c. Aconitine	1 grain = 0·065 grm.	Not less than 0·5 p.c. (on dried root) Aconitine ..	Single. — 1½ grns. = 0·1 gramme.. .. Daily. — 4½ grns. = 0·3 gramme.. ..	..
,, Fluid Extract ..	..	..	0·4 p.c. w/v Aconitine	1 minim = 0·05 c.c.	..	..	(Extract) 1 p.c. alkaloids.
,, Tincture	..	5 to 15 minims = 0·3 to 0·9 c.c.	0·045 p.c. w/v Aconitine ..	10 minims = ·6 c.c.	From stdd. root 1 and 10 ..	Single. — 7½ grns. = 0·5 gramme.. .. Daily. — 22½ grains =1·5 gramme ..	0·05 p.c. w/w alkaloid
Belladonna Leaves ..	..	..	Not less than 0·3 p.c. total mydriatic alk. ..	1 grain = 0·065 grm.	Not standardised	Single.—3 grains = 0·2 gramme.. .. Daily.—9 grains = 0·6 gramme.. ..	..
,, Extract ..	..	¼ to 1 grain = 0·016 to 0·065 gramme.. ..	1·4 p.c. total mydriatic alk.	⅙ grain = 0·010 grm.	Not less than 1·5 p.c. Atropine	Single. — ¾ grain = 0·05 gramme .. Daily.—2¼ grains = 0·15 gramme ..	..
,, Tincture ..	..	..	0·035 p.c. w/v total mydriatic alk.	8 minims = 0·5 c.c.	..	..	..
Belladonna Root	Not standardised .	..	0·45 p.c. mydriatic alk.	⅔ grain = 0·045 grm.	..	..	..
,, **Extract** (Alcoholic)	1·0 p.c. alkaloids..	¼ to 1 grain = 0·016 to 0·065 gramme.. ..	..	..	..	..	..
,, **Fluid Extract** ..	0·75 p.c. w/v alkaloids	..	0·4 p.c. w/v mydriatic alk. ..	1 minim = 0·05 c.c.	..	..	..
, **Tincture**	Not less than 0·048 nor more than 0·052 p.c. w/v alkaloids	5 to 15 min. = 0·3 to 0·9 c.c.	..	..	..	..	..
Cantharides	..	..	..	..	At least 0·8 p.c. Cantharidin	Single.—¾ grain 0·05 gamme .. Daily.—2¼ grains = 0·15 gramme .	0·4 p.c. Cantharidin.

Cinchona	5 to 6 p.c. total alkaloids, not less than ½ of which should consist of Quinine and Cinchonidine	..	Not less than 5 p.c. total and at least 4 p.c. of anhyd. Ether-soluble alkaloids	15 grains=1 gramme	5·06 total alkaloids	..	At least 5 p.c. total alkaloids yielding at least 1·5 p.c. basic Q.S.8H_2O. = 1·257 p.c. basic Q.S.8H_2O dried at 100 C. [Quinine. =1·092 p.c. anhydrous
,, Fluid Extract	5·0 p.c w/v total alkaloids	5 to 15 minims = 0·3 to 0·9 c.c.	4 p.c. w/v anhyd. Ether-sol. alk.	15 minims = 1 c.c.	..	..	Extract not less than 6 p.c. w/w total alk.
,, Tincture ..	0·95 to 1·05 p.c. w/v total alkaloids ..	½ to 1 fl. drm. = 1·8 to 3·6 c.c.	0·75 p.c. w/v anhyd Ether-sol. alk.	1 fl. drm. = 4 c.c. ..	Stdd. root, 1 and 5	..	..
Coca	..	..	Not less than 0·5 p.c. Ether-soluble alk. ..	30 grains = 2 grms.	..	..	..
,, Fluid Extract ..	..	½ to 1 fl. drm. = 1·8 to 3·6 c.c.	0·5 p.c. w/v Ether-soluble alk. ..	30 minims = 2 c.c.	..	..	..
Colchicum Corm... ..	..	2 to 5 grains = 0·18 to 0·32 gramme	Not less than 0·35 p.c. Colchicine	4 grains = 0·25 grm.	..	..	..
,, Extract ..	..	½ to 1 grain = 0·016 to 0·065 gramme.. ..	1·4 p.c. Colchicine	1 grain = 0·065 grm.	..	..	..
Colchicum Seeds	..	..	Not less than 0·45 p.c. Colchicine	3 grains = 0·2 grm.	..	..	..
,, Fluid Extract	..	..	0·4 p.c. w/v Colchicine	3 minims = 0·2 c.c.	..	..	..
,, Tincture ..	..	5 to 15 minims = 0·3 to 0·9 c.c..	0·04 p.c. w/v Colchicine	30 minims = 2 c.c.	..	..	..
Conium	..	..	Not less than 0·5 p.c. Coniine ..	3 grains = 0·2 grm.	..	Single.—3 grains = 0·2 gramme.. .. Daily.—9 grains = 0·6 gramme	..
,, Fluid Extract ..	..	..	0·45 p.c. w/v Coniine	3 minims = 0·2 c.c.	..	..	..
,, Tincture	..	½ to 1 fl. drm. = 1·8 to 3·6 c.c.	..	..	..	..	..
Granati Cortex	..	..	..	..	0·4 p.c. alkaloids, mean combining weight of Pelletierine and Methyl-Pelletierine ..	..	Not less than 0·25 p.c. alkaloids.

A TABULATED COMPARISON OF THE CHIEF STANDARDISED POTENT PREPARATIONS OF THE BRITISH, UNITED STATES, GERMAN AND FRENCH (1908) PHARMACOPŒIAS—*continued.*

—	B.P.		U.S.P.		P.G. IV.		French Codex 1908.
	Standard.	Dose.	Standard.	Dose.	Standard.	Dose.	
Guarana	..	..	Not less than 3·5 p.c. alkaloidal principles ..	30 grains = 2 grms.	..	..	..
,, Fluid Extract	..	..	3·5 p.c. w/v alkaloidal principles	30 minims = 2 c.c.	..	..	..
Hydrastis	..	..	Not less than 2·5 p.c. Hydrastine	30 grains = 2 grms.	2·0 p.c. Hydrastine	..	..
,, Fluid Extract	..	5 to 15 minims = 0·3 to 0·9 c.c.	2·0 p.c. w/v Hydrastine	30 minims = 2 c.c.	2·0 p.c. w/w Hydrastine ..	..	At least 2 p.c. w/w Hydrastine; also Extract containing at least 10 p.c. Hydrastine.
,, Tincture ..	..	½ to 1 fl. drm. = 1·8 to 3·6 c.c.	Not less than 0·4 p.c. w/v Hydrastine	1 fluid drm. = 4 c.c.	..	..	..
Hyoscyamus	..	..	Not less than 0·08 p.c. mydriatic alk.	4 grains = 0·25 grm.	..	Single.—6 grains = 0·4 gramme .. .. Daily.—18 grains = 1·2 gramme	
,, Extract	..	2 to 8 grains = 0·13 to 0·52 gramme	0·3 p.c. mydriatic alk.	1 grain = 0·065 grm.	0·75 p.c. Hyoscyamine ..	Single. — 1½ grains = 0·1 gramme .. Daily.—4½ grains = 0·3 gramme	.
,, Fluid Extract	..	..	0·075 p.c. w/v mydriatic alk. ..	3 minims = 0·2 c.c.	..	..	..
,, Tincture ..	..	½ to 1 fl. drm. = 1·8 to 3·6 c.c.	0·007 p.c. w/v mydriatic alk. ..	30 minims = 2 c.c.	..	..	..
Ipecacuanha Root ..	..	Expectorant.—¼ to 2 grains = 0·016 to 0·13 gramme .. .. .. Emetic.—15 to 30 grains = 1 to 2 grammes	Not less than 1·75 p.c. Ipec. alkaloids	Expectorant. — 1 grn. = 0·065 grm. Emetic.—15 grains = 1 gramme ..	2·0 p.c. total alkaloids, mean comb. wgt. of Emetine and Cephaeline ..	..	Not less than 2 p.c. alkaloids.
,, Fluid Extract	2·0 to 2·25 p.c. w/v alkaloids	Expectorant.—½ to 2 min. = 0·03 to 0·12 c.c. .. .. Emetic. — 15 to 20 min. = 0·9 to 1·2 c.c.	1·5 p.c. w/v Ipec. alkaloids	Expectorant. — 1 minim = 0·05 c.c. Emetic. — 15 mins. = 1 c.c.	..	..	..
Jalap	9·0 to 11·0 p.c. Jalap Resin	5 to 20 grains = 0·32 to 1·3 grammes	Not less than 7·0 p.c. total Resin, of which not more than 15 p.c. should be Ether-soluble.	15 grains = 1 grm.	9·0 p.c. at least Jalap Resin	..	7 p.c. Jalap Resin.

Kola	..	..	..	..	..	..	Not less than 1·25 p.c. Caffeine.
,, Extract	..	..	..	..	..	..	Not less than 10 p.c. Caffeine.
,, Fluid Extract.. ..	..	..	..	..	..	..	Not less than 1·25 p.c. Caffeine.
Nux Vomica Seeds ..	..	1 to 4 grains = 0·065 to 0·26 gramme	Not less than 1·25 p.c. Strychnine	1 grain = 0·065 grm.	Not less than 2·5 p.c. mixed alk. on dried seeds	Single.—1½ grains = 0·1 gramme.. .. Daily. — 3 grains = 0·2 gramme.. ..	Not less han 2 p.c. nor more than 3 p.c. total alkaloids.
,, Extract	5·0 p.c. Strychnine	¼ to 1 grain = 0·016 to 0·065 gramme.. ..	5 p.c. Strychnine	¼ grain = 0·015 grm.	17·5 p.c. mixed alkaloids ..	Single. — ¾ grain = 0·05 gramme .. Daily.—1½ grains = 0·10 gramme ..	Exactly 16 p.c. total alkaloids.
,, Fluid Extract	1·5 p.c. w/v Strychnine	1 to 3 minims = 0·06 to 0·18 c.c.	1·0 p.c. w/v Strychnine	1 minim = 0·05 c.c.	..	..	..
,, Tincture ..	0·24 to 0·26 p.c. w/v Strychnine	5 to 15 minims = 0·3 to 0·9 c.c...	0·1 p.c. w/v Strychnine ..	10 minims = 0·6 c.c.	Not less than 0·25 p.c. w/w mixed alkaloids	Single.—1·0 grm. = 15 grains .. .. Daily.—30 grains = 2 grammes	0·25 p.c. w/w total alkaloids.
Opium	Not less than 7·5 p.c. anhyd. Morphine	½ to 2 grains = 0·032 to 0·13 gramme ..	Not less than 9·0 p.c. cryst. Morphine	1½ grains = 0·1 grm.	10 to 12 p.c. Morphine	Single.—2 grains = 0·15 gramme .. Daily.—7½ grains = 0·5 gramme	Not less than 10 p.c. Morphine.
,, Extract..	20·0 p.c. anhyd. Morphine	¼ to 1 grain = 0·016 to 0·065 gramme.. ..	20·0 p.c. cryst. Morphine ..	½ grain = 0·03 grm.	15 to 20 p.c. Morphine	Single.—2½ grains = 0·15 gramme .. Daily.—7½ grains = 0·5 gramme	20 p.c. Murphine.
,, Tincture	0·75 p.c. w/v anhyd. Morphine..	Repeated. — 5 to 15 min. = 0·3 to 0·9 c.c. Single.—20 to 30 min. = 1·2 to 1·8 c.c. ..	1·2 to 1·25 p.c. w/v cryst. Morphine	8 minims = 0·5 c.c.	1·0 to 1·2 p.c. w/w Morphine	Single. — 22½ grains = 1·5 grammes .. Daily.—77 grains = 5·0 grammes ..	1 p.c. w/w Morphine.
,, ,, Crocata	..	..	..	..	1·0 to 1·2 p.c. w/w Morphine	Single.—22½ grains = 1·5 grammes .. Daily.—77 grains = 5·0 grammes ..	1 p.c. w/w Morphine.
,, ,, Benzoica	0·05 p.c. w/v anhyd. Morphine..	½ to 1 fl. drm. = 1·8 to 3·6 c.c.	..	..	0·05 p.c. w/w Morphine ..	..	0·05 p.c. w/w Morphine.
Physostigma Seeds ..	..	..	Not less than 0·15 p.c. Ether-soluble alk. ..	1½ grains = 0·1 grm.	..	..	..
,, Extract ..	..	¼ to 1 grain = 0·016 to 0·065 gramfne.. ..	2·0 p.c Ether-soluble alk. ..	⅛ grain = 0·008 grm.	..	..	..
,, Tincture..	..	..	0·014 p.c. w/v Ether-sol. alk.	15 minims = 1 c.c.	..	..	..
Pilocarpus (Jaborandi)	..	..	Not less than 0·5 p.c. alkaloids..	30 grains = 2 grms.	..	..	..
,, Fluid Extract	..	5 to 15 minims = 0·3 to 0·9 c.c.	0·4 p.c. w/v alkaloids	30 minims = 2 c.c.	..	..	..
,, Tincture ..	..	½ to 1 fl. drm. = 1·8 to 3·6 c.c.	..	..	..	..	..

A TABULATED COMPARISON OF THE CHIEF STANDARDISED POTENT PREPARATIONS OF THE BRITISH, UNITED STATES, GERMAN AND FRENCH (1908) PHARMACOPŒIAS—*continued.*

—	B.P.		U.S.P.		P.G. iv.		French Codex 1908.
	Standard.	Dose.	Standard.	Dose.*	Standard.	Dose.	
Scopola	..	..	Not less than 0·5 p.c. mydriatic alk.	0·045 grm. = ¾ grn.	..	..	..
,, Extract	..	..	2·0 p.c. mydriatic alk	0·01 grm. = ⅕ grain	..	..	..
,, Fluid Extract ..	..	..	0·5 p.c. w/v mydriatic alk. ..	0·05 c.c. = 1 minim	..	..	..
Stramonium	..	..	Not less than 0·25 p.c. mydriatic alk.	1 grain = 0·065 grm.	..	Single.—3 grains = 0·2 gramme .. .. Daily.—9 grains = 0·6 gramme	..
,, Extract	..	(From seeds) ¼ to 1 grain = 0·016 to 0·065 gramme	1·0 p.c. mydriatic alk.	⅕ grain = 0·01 grm.	..	..	..
,, Fluid Extract	..	..	0·25 p.c. w/v mydriatic alk. ..	1 minim = 0·05 c.c.	..	..	..
,, Tincture ..	..	(From leaves) 5 to 15 minims = 0·3 to 0·9 c.c.	0·025 p.c. w/v mydriatic alk. ..	8 minims = 0·5 c.c.	..	..	..

MATERIA MEDICA

WITH

COMPOUNDS AND PREPARATIONS.

Not Official.

ABSINTHIUM.

WORMWOOD.

The leaves and flowering tops of *Artemisia Absinthium*, L. The drug possesses an aromatic odour and a very bitter taste. It contains a crystallisable bitter principle, **Absinthin,** slightly soluble in Water, readily in Absolute Alcohol, Chloroform and Ether; also a volatile oil, to which its physiological properties are due.

Medicinal Properties.—Cerebral stimulant. Absinthe, an alcoholic beverage used on the Continent, contains the chief constituents of Wormwood; its excessive use causes the disease known as absinthism.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Fr., (Absinthe), Ger. (Wermut), Hung., Ital. (Assenzio), Jap., Mex., Norw., Port. (Losna), Russ., Span. (Ajenjo), Swed. and Swiss. An extract is official in Belg., Fr., Ger., Ital., Port., Russ., Span., Swed. and Swiss.

Descriptive Notes.—Wormwood has silvery leaves, due to the surface on both sides being covered with appressed silky hairs, each attached by a central stalk of two to four cells. The leaves are tripinnatisect near the root with short pinnules about ½ inch long. The upper leaves are less divided, becoming trifid or simple on the inflorescence, which is a panicle of small globular greenish-yellow capitula about ⅛ of an inch in diameter. It is a local plant often occurring about old farmyards, especially near the sea. The mugwort (*Artemisia vulgaris*, L.) bears a resemblance to Wormwood, but the flower heads are oblong and the leaves are dark green on the upper surface, but silvery beneath. The leaves are larger and more acute.

TINCTURA ABSINTHII.—Wormwood, 1; Alcohol (60 p.c.), to make 10.

Dose.—1 to 4 fl. drm. = 3·6 to 14·2 c.c.

Foreign Pharmacopœias.—Official in Belg., Dan., Ger., Ital., Mex., Norw., Port., Russ. and Swiss, 1 in 5; Austr. and Hung. (compound), 1 in 10, Mex. (compound), 1 in 40; Swed. and Swiss (compound), 1 in 12½; all by weight.

ACACIÆ GUMMI.

GUM ACACIA.

FR., GOMME ARABIQUE; GER., ARABISCHES GUMMI; ITAL., GOMMA ARABICA; SPAN., GOMA ARABIGA.

A colourless or yellowish product obtained from *Acacia Senegal* and other species.

Solubility.—1 in 1 of Water. Insoluble in Absolute Alcohol, Ether and Oils.

Medicinal Properties.—Demulcent. Allowed to dissolve slowly in the mouth, allays tickling cough. For a demulcent drink, 1 of Mucilage, 1 of Syrup, and 20 of Water.

Prescribing Notes.—*It is chiefly used in the form of Mucilage in cough linctuses and lozenges, and to render oils, etc., emulsive with aqueous fluids.*

In an 8 oz. mixture 3 drm. of Mucilage of Gum Acacia are usually required for 1 oz. of oils or resinous tinctures, and 10 drm. for 1 oz. of Balsam of Copaiba. The Mucilage should be put into a mortar and the oil added by degrees with constant trituration until an emulsion is formed, then the Water or other aqueous fluid can be added by degrees. Resinous tinctures should be added to the Mucilage which has been first diluted with twice its volume of Water, but Fixed and Volatile Oils are best added to the undiluted Mucilage. It is impossible to make a nice emulsion with Oil of Male Fern unless the Mucilage be quite fresh; in such case it is better to make the Mucilage at the time by rubbing 2 of powdered Gum with 3 of Water. Another method, which gives good results with fixed oils, is to replace the Mucilage by half its weight of powdered Gum Acacia, rub the oil with the powder, then add all at once Water equal to double the weight of the powder and rub till an emulsion is formed; now add by degrees the remainder of any aqueous liquid ordered in the prescription. Resin of Copaiba makes a nice emulsion with powdered Gum and Water: the Resin is liquefied in a warm mortar, the powdered Gum mixed with it and then the Water added as in the last instance. Mucilage is used to suspend insoluble powders in mixtures, but in some cases (Bismuth salts, for instance) Tragacanth answers better. It used to be employed for making powders into pills, but they soon became hard, and it is now displaced by 'Dispensing Syrup' (see '*Glycerin*'), *Glucose, Syrup of Glucose, 'Diluted Glucose,' or Glycerin of Tragacanth.*

Official Preparations.—Mucilago Acaciæ; also used in the preparation of Pulvis Amygdalæ Compositus, Pulvis Tragacanthæ Compositus, and all Trochisci.

Not Official.—Mucilago Acaciæ, Mistura Mucilaginosa, Potion Gommeuse, Sirop de Gomme, Syrupus Acaciæ; also used in the preparation of Unna's Gum Pastes.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Descriptive Notes.—Gum Acacia is derived from different species of *Acacia* occurring in different countries, and in some cases from more than one species in the same district, and consequently is not uniform in character. It is sorted on its arrival in European ports into different qualities for various economic uses; hence for medicinal use, only the selected or 'picked' gum corresponding to the *B.P.* description should be used. The finest for this purpose is the Khordofan, or 'Turkey' gum of commerce, and is derived from *Acacia Senegal*, Willd.

The Gum Acacia official in the *B.P.* for medicinal use is limited to the finer commercial qualities, and is characterised by the opaque outer surface, translucent interior, nearly white or faint yellowish-white colour, by readily breaking up into angular fragments, being almost odourless, with a mucilaginous but insipid taste. *See* also Tests.

Gum that gives a glairy or ropy mucilage, like some samples of Talca and Sennaar gum, is not admissible.

Senegal gum is derived from *A. Seyal*, Delile, in the Soudan, and from *A. Adansonii*, Guill. and Perr., in Senegal. It differs from the Khordofan gum in the less cracked surface and the tough and less easily fractured interior, and is characterised by the presence of vermicular amongst the rounded pieces. The mucilage is very adhesive, and is valuable for technical purposes.

East African gum of Senegal character, and similar gum exported from Jafferabad reach England *viâ* Bombay, and are known in commerce as East India or Bombay gum. That exported from Senegal comes *viâ* Bordeaux, but all possess the same characters. True East Indian gum is very mixed in character, and several commercial varieties are recognised derived from different trees, the term amrad being applied to the reddish kinds.

West African gum (*A. nilotica*, Delile) resembles Senegal gum, but occurs in larger pieces, without vermicular pieces intermixed.

Cape gum (*A. horrida*, Willd., and *A. Kraussiana*, Meissn.) is distinguished by its very brittle character, and by giving a weak and not strongly adhesive mucilage.

Australian gum (*A. pycnantha*, Benth.) is usually reddish, and contains Tannin. Selected white qualities of these gums can only be used if they comply with the above tests.

The Talca or Sennaar gum (*A. Fistula*, Schweinf.) that gives a ropy mucilage is not easily distinguished from small gum of good quality until dissolved, except by the presence of a faint greenish tinge.

The Gummi Indicum of the *Ind.* and *Col. Add.* is derived from *Anogeissus latifolia*, Wall., and occurs in vermicular or rounded nodules, almost white if of good quality, translucent when fractured, but tough rather than brittle, and often with small fragments of bark attached, a characteristic feature which is not recognised in the Pharmacopœia. It is required, nevertheless, to yield not more than 4 p.c. of ash. The mucilage differs from that of Gum Acacia in being proportionally twice as viscid and in having a more pronounced taste.

Tests.—Gum Acacia dissolves entirely in Water, forming a distinctive more or less transparent mucilaginous liquid, which possesses a feebly acid reaction towards blue Litmus paper; it is insoluble in Alcohol (90 p.c.); its aqueous solution is precipitated by Solution of Lead Subacetate, but not by Lead Acetate Solution; and is also precipitated by strong solutions of Borax.

The more generally occurring adulterations are gums of inferior origin, Starch or Dextrin, Tannic Acid, certain Sugars, and an excessive amount of mineral matter. Inferior gums are detected by the glairy mucilage produced when the gum is dissolved in an equal weight of Water, and by the formation of a gummy deposit when this mucilage is further diluted with Water and allowed to stand; Starch or Dextrin is readily detected by Iodine Solution; Tannic Acid by the bluish-black coloration produced with Ferric Chloride Test-solution; the Sugars by Fehling's (Potassio-cupric Tartrate) Solution, and excess of mineral matter by the amount of ash left on ignition. This should not amount to more than 4 p.c. Three samples recently examined in the author's laboratory yielded 2·8, 2·9, and 3·0 p.c. The limit of ash adopted by the *B.P.* and *U.S.P.* is 4·0 p.c.; by the *P.G.*, 5·0 p.c.

Preparation.

MUCILAGO ACACIÆ. MUCILAGE OF GUM ACACIA.

4 of washed Gum Acacia dissolved in 6 of Water; the product measures about 8¾.

Dose.—1 to 4 fl. drm. = 3·6 to 14·2 c.c. or more.

Mucilage keeps well if made cold, poured into small bottles quite full, and stored in a cool place, but if kept carelessly it becomes sour very quickly in hot weather, and its emulsive property is impaired; if made with hot Water the change is more rapid.

Incompatibles.—Strong Alcohol and Sulphuric Acid; Borax, Ferric salts and Lead Subacetate render it gelatinous. It is not affected by neutral Lead Acetate.

Foreign Pharmacopœias.—Official in Dutch and Port., 2 and 3; Fr. and Mex., 1 and 1; Dan., Ger., Hung., Ital., Jap., Norw., Russ., Swed. and Swiss, 1 and 2; Span., 1 and 3; Belg., 1 and 9; Austr. and U.S., 34 in 100. All by weight.

Not Official.

MUCILAGO ACACIÆ (*U.S.*).—Washed Gum Acacia, 34; Lime Water, 33; Water, to make 100; all by weight.

MISTURA MUCILAGINOSA.—Syrup, 30 minims; Mucilage of Gum Acacia, 2 fl. drm.; Water, to 1 oz.—*Guy's.*

POTION GOMMEUSE.—Powdered Gum Arabic, 1; Simple Syrup, 3; Orange Flower Water, 1; Water, 10; all by weight.—*Fr.*
This has been incorporated in the *B.P.C.* as follows:—
Mistura Acaciæ. *Syn.* Potion Gommeuse.—Gum Acaciæ, in coarse powder, 6; Syrup, 16; Orange Flower Water, 6; Distilled Water, *q.s.* to produce 100.

SIROP DE GOMME.—Gum, 10; Sugar, 56; Water, 34; dissolve the Gum in cold Water, then the Sugar by the aid of a water-bath, and strain.—*Fr.*

SYRUPUS ACACIÆ (*U.S.*).—Selected Gum Acacia, 10; Sugar, 80; Distilled Water, to make 100 by volume.
The formula in the previous edition of the *U.S.P.* reads:—
Syrupus Acaciæ.—Mucilage of Acacia, 25; Syrup, 75.
This latter has been incorporated in the *B.P.C.*
It has been suggested that the Mucilage of Acacia should be made with Chloroform Water to overcome the tendency to fermentation.

UNNA'S GUM PASTES.—A mixture of equal parts of Mucilage of Gum Acacia and Glycerin, with which are incorporated various medicaments such as Zinc Oxide and Mercuric Oxide.

ACACIÆ CORTEX.—The dried bark of *Acacia Arabica*, and also the dried bark of *Acacia decurrens*, Willd., the Sydney Black Wattle, or of the Victorian and Tasmanian Black Wattle, are official in *Ind.* and *Col. Add.* for India and the Australian and Eastern Colonies.
Decoctum Acaciæ Corticis (1 in 16) is also official in *Ind.* and *Col. Add.* for India and the Australian and Eastern Colonies.
See also **Gummi Indicum.**

Not Official.

ACALYPHA.

The fresh and the dried herb of *Acalypha Indica*, L., are official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Extractum Acalyphæ Liquidum (1 in 1 with Alcohol 90 p.c.), dose 5 to 30 minims = 0·3 to 1·8 c.c.

Succus Acalyphæ, the juice expressed from the bruised fresh Acalypha 3; Alcohol (90 p.c.), *q.s.* to yield 4; dose, 1 to 4 fl. drm. = 3·6 to 14·2 c.c.
Both the Liquid Extract and the Succus are official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

ACETANILIDUM.

ACETANILIDE.

C_8H_9NO, eq. 134·10.

B.P.Syn.—PHENYL-ACETAMIDE. Commonly known as 'Antifebrin.'

Colourless, glistening, crystalline lamellæ, having a burning and somewhat bitter taste, or a white crystalline powder.

It is the Monacetyl derivative of Aniline, and is prepared by the action of Glacial Acetic Acid upon Aniline.

Solubility.—1 in 190 of Water; 1 in 18 of boiling Water; 1 in 12 of Alcohol (60 p.c.); 1 in 4 of Alcohol (90 p.c.); about 1 in 40 of Glycerin; it is also soluble in Ether, Benzol, and Chloroform.

Medicinal Properties.—A powerful antipyretic. Useful in the pyrexia of typhoid fever, erysipelas, phthisis, acute rheumatism, and smallpox. An analgesic in neuralgia and other painful nerve affections, such as locomotor ataxia.

In some cases it produces profuse sweating, accompanied with cyanosis and rigor; it is therefore safer to commence with small doses.

From the report of a committee of the British Medical Association, it would appear that Antifebrin is less safe and less constant in its action than Antipyrine, and still less so than Phenacetin; but it is possible that the ill-effects noted were brought about by injudicious dosage. To give it in doses of 5, 6, 8, or even 10 grains, still more to repeat these after a short interval, is highly injudicious; such doses are excessive. The relative dose appears to be about one-fifth that of Antipyrine (*see* Phenazonum).—*B.M.J.* '94, i. 89.

Cases of poisoning by Acetanilide—death after taking 60 grains in 6 powders.—*B.M.J.E.* '02, i. 20; *L.* '02, i. 243.

Antidotes.—Alcohol, Strychnine, Ether, warmth to feet, etc., Oxygen inhalation.

Dose.—1 to 3 grains = 0·06 to 0·2 gramme.

Ph. Ger. maximum single dose, 0·5 gramme; maximum daily dose, 1·5 grammes.

Prescribing Notes.—*Best given in wafer paper or* **cachets**, *or dissolved in some weak spirit. May also be suspended in Water by Compound Powder of Tragacanth or Mucilage of Gum Acacia. It is sometimes given as a compressed tablet, or as an effervescent granule.*

Not Official.—Mistura Acetanilidi, Pulvis Acetanilidi Compositus, Ammonol, Hydracetin, Neuronal, Phenalgin, Bromoacetanilide.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Jap., Mex., Norw., Russ., Span., Swed., Swiss and U.S. Not in the others.

Tests.—Pure dry Acetanilide melts at 113° to 114° C. (235·4° to 237·2° F.); commercial Acetanilide melts at 111·36° C. (232·45° F.); dried Acetanilide at 112·42° C. (234·35° F.), and purified Acetanilide at 113·49° C. (236·28° F.). The *B.P.* gives the melting point when dry as 113·5° C. (236·5° F.); the *U.S.P.* gives 113° C. (235·4° F.); the *P.G.* 113° to 114° C. (235·4° to 237·2° F.). The melting point given in the *B.P.* will only be found in samples which have been purified, and dried at 100° C. (212° F.). Most commercial samples melt somewhat lower. It visibly softens several degrees below the actual melting point. If heated below Water it fuses considerably under 100° C. (212° F.). The method of determining melting points adopted by the *B.P.* has been commented upon (*Y.B.P.* '99, 427; *C.D.* '99, ii. 219, 231) and the melting points of several substances taken by four different methods compared. Great variation was found between dried and undried commercial articles and purified products. It would appear that the *B.P.* figures are compiled, and not the result of actual determination. This surmise is confirmed by a statement made by Professor Attfield that 'in the future it must be distinctly understood that the method described in the *B.P. Appendix* had not necessarily been the one by which the melting points recorded in the Pharmacopœia had been determined.' The boiling point usually given is 295° C. (563° F.), but it volatilises to a considerable extent at 100° C. (212° F.), and if an aqueous solution be distilled, Acetanilide may be detected in the distillate by the Isonitrile test. The *U.S.P.* gives the boiling point as 295° C. (563° F.) and states that it boils without decomposition.

The distinguishing test for Acetanilide is the formation of the disagreeable and highly-poisonous odour of Phenyl-Isonitrile when a minute quantity of the specimen is heated with Potassium Hydroxide Solution, a few drops of Alcohol (90 p.c.) and a little Chloroform. When heated with Potassium Hydroxide Solution alone, the characteristic aromatic odour of Aniline is evolved. The test is common to the *B.P.*, *U.S.P.* and *P.G.*, the *U.S.P.* giving quantities 0·1 gramme Acetanilide, 5 c.c. of Potassium Hydroxide Solution, and 1 c.c. of Chloroform. Various other substances yield odours somewhat resembling Phenyl-Isonitrile when treated by the Isonitrile test, but the interfering action of these substances may be destroyed by the following modification of the test, which has been tried in the author's laboratory and found to be very satisfactory, readily detecting an addition of 2 p.c. of Acetanilide. The substances experimented on were Methacetin, Phenacetin, Lactophenin, Salophen, and Phenocoll Hydrochloride. The test was carried out in the following manner:—A weighed quantity of 0·1 gramme of each of the substances is boiled with 10 c.c. of Water (Salophen is the only one not soluble in 10 c.c. of boiling Water), the mixture is cooled quickly by immersion in cold Water and filtered through Cotton-Wool. To 2 or 3 c.c. of the filtrate is added an equal volume of Potassium Hydroxide Solution (5 p.c.). The liquid is boiled, and small fragments of Potassium Permanganate added until the green colour first produced gives way to violet or purple. Two or three drops of a mixture made of 10 c.c. of Chloroform, 10 c.c. of Alcohol (90 p.c.), and 5 c.c. of Ammonia Solution are added, the mixture boiled, and a little more of the Chloroform, Alcohol, and Ammonia mixture added if the Permanganate has not been reduced completely. After the Chloroform has vaporised by standing a few moments, the odour is noted, and compared, if doubtful, with that yielded by a minute fragment of Acetanilide or a dilute Acetanilide solution. In testing Exalgin omit the Potassium Permanganate, otherwise the test is made as above.

The *U.S.P.* and the *P.G.* give a confirmatory test for Aniline, the former requiring that 0·1 gramme of Acetanilide, when boiled with 2 c.c. of Hydrochloric Acid for several minutes, shall yield a clear solution which, when mixed with 3 c.c. of a 1 in 20 aqueous Phenol Solution and 5 c.c. of filtered saturated Chlorinated Lime Solution, shall produce a brownish-red colour, changing to deep blue on supersaturation with Ammonia Solution. The *B.P.* does not give a similar test, neither does it specifically require Acetanilide to afford 'the reactions characteristic of Acetic Acid.' The acetic radical may be satisfactorily tested for, by warming a little of the specimen with Potassium Hydroxide Solution, cooling and removing the Aniline by means of Ether. The residue left after the evaporation of the Ether from the ethereal liquid, may be examined for Aniline by the Chlorinated Lime and Ammonia test. A portion of the aqueous liquid, after the removal of the dissolved Ether, is mixed with an equal volume of Sulphuric Acid (the mixture being meanwhile kept cool), a few drops of Alcohol (90 p.c.) are added and the liquid warmed, the characteristic odour of Acetic Ether is evolved.

A cold saturated aqueous solution decolorises Bromine Water and at the same time throws down a white precipitate quite distinct even at a dilution of 1 in 2000. If the Bromine Water precipitate be dissolved by heat, it crystallises out on cooling in long tufted needles. The production of this insoluble Bromine compound distinguishes Acetanilide from Phenacetin. The Isonitrile test distinguishes it from Methylacetanilide (Exalgin), Phenacetin, and Phenazone (Antipyrine), neither of these substances yielding the reaction with this test.

The more generally occurring impurities are free Acetic Acid, unconverted Aniline, Aniline salts and mineral matter. Acetanilide should be neutral in reaction towards Litmus solution, as is also Phenacetin, but with Acetone and Aniline salts the solution becomes red, and with Phenazone blue, so that the reaction towards Litmus at once detects the presence of free Acetic Acid and affords confirmatory evidence of the presence of Acetone, Aniline salts or Phenazone. The reaction in the cold towards Ferric Chloride Test-solution ensures the absence of Acetone, Phenazone and salts of Aniline. The aqueous solution of Acetanilide should not be affected by this reagent. Acetone is a most unlikely impurity, and the object of answering a test is therefore not apparent. The value of Ferric Chloride as a reagent for Acetone is, moreover, open to question. Phenazone gives a deep red coloration, which is discharged by strong Hydrochloric Acid. On boiling, Acetanilide and Phenacetin solutions become red, and in both cases the colour is discharged by strong Hydrochloric Acid. Aniline Chloride with this reagent gives no change at first, but in a few moments becomes green. Very little importance can be attached to the behaviour of Acetanilide when boiled with Ferric Chloride Test-solution, as the Ferric Chloride itself becomes of a reddish-brown colour on boiling, owing to the formation of basic Iron salts. Acetanilide should form practically colourless solutions with Sulphuric or Nitric Acid, indicating the absence of readily charred organic impurities, Phenacetin and

Phenazone. Phenacetin gives a colourless solution with Sulphuric Acid, but a deep orange colour with Nitric Acid. Phenazone gives a green coloration with Nitric Acid. The latter impurity on account of its much higher price is unlikely to appear as an adulterant of this substance. The tests with Sulphuric Acid and Nitric Acid are common to the *B.P.* and *P.G.* The *U.S.P.* includes a Sulphuric Acid test but no Nitric Acid test. The sample should leave no weighable residue after ignition. This statement is common to the *B.P.*, *U.S.P.* and *P.G.*

Not Official.

MISTURA ACETANILIDI.—Acetanilide, 5 grains; Compound Tincture of Lavender, 1 fl. drm.; Spirit of Chloroform, 15 minims; Water, to 1 fl. oz.

PULVIS ACETANILIDI COMPOSITUS (*U.S.*). — Acetanilide, 7; Caffeine, 1; Sodium Bicarbonate, 2.

Dose.—3 to 5 grains = 0·2 to 0·32 gramme.

This formula was in the *B.P.C. Formulary* 1901, and is now incorporated in the *B.P.C.*

The specialities, **Antikamnia, Antisepsin,** and **Antitoxine,** all contain Acetanilide.

AMMONOL.—An ammoniated derivative of Acetanilide. Soluble about 1 in 110 of Water; partly soluble in Alcohol (90 p.c.).

Dose.—5 to 10 grains = 0·32 to 0·65 gramme. The doses of the **Salicylate, Bromide,** and **Lithiate** are practically the same. The Salicylate darkens on exposure to light; it is soluble 1 in 50 of Water.

HYDRACETIN (Acetylphenylhydrazin). — Colourless prismatic crystals, soluble in Water and in Alcohol (90 p.c.). It is a powerful but dangerous antipyretic; has been given internally in doses of 1 to 2 grains, and has been used externally as a 10 p.c. ointment in psoriasis.

It should be reckoned as a poisonous rather than as a therapeutic agent (Stockman).—*B.M.J.* '98, ii. 1054; decidedly harmful (Leech).—*B.M.J.* '98, ii. 1056.

NEURONAL (Bromo-diethylacetamide). — A crystalline substance only slightly soluble in Water. It contains about 41 p.c. of Bromine. Introduced as a hypnotic and sedative.

Dose.—10 to 20 grains = 0·65 to 1·3 grammes.

It is stated (*B.M.J.* '04, ii. 1414; *B.M.J.E.* '05, i. 21) to be of special value in cases of epilepsy.

It contains a large proportion of Bromine and is said (*B.M.J.* '05, ii. 4) to act well in conditions of excitement and nervous irritability. The hypnotic action is pure and is added to the sedative action which is dependent on the Bromine.

In 40 cases in an asylum for the insane (*B.M.J.E.* '05, ii. 16), ½ grain as a commencing dose, when excitement was present as much as 3 grains was given for a single dose, and 6 grains for a daily dose. The rapidity of its action gives it an advantage over other hypnotics.

It is a very useful hypnotic (*L.* '05, ii. 119) in cases of simple insomnia and in states of mental confusion or a sub-acute mania. It has no cumulative effect when given for many days. Dose does not require increasing, and when the drug is left off no trouble apparently arises.

PHENALGIN.—An ammoniated derivative of Acetanilide. A white powder, soluble about 1 in 110 of Water; partly soluble in Alcohol (90 p.c.).

Dose.—5 to 20 grains = 0·32 to 1·3 grammes.

BROMOACETANILIDE (Antisepsin; Asepsin).—Colourless crystals, practically insoluble in Water and Alcohol (90 p.c.).

Dose.—3 to 15 grains = 0·2 to 1 gramme.

Not Official.

ACETUM.

VINEGAR.

FR., VINAIGRE; GER., ESSIG; ITAL., ACETO; SPAN., VINAGRE.

A clear colourless or yellowish-brown liquid, possessing an acetous odour and taste. It should contain about 5 p.c. of Hydrogen Acetate. It is produced by the alcoholic and acetous fermentation of a vegetable juice or infusion.

Medicinal Properties.—Refrigerant and sialagogue. As a cooling **lotion** in bruises and sprains. Sponged on the skin in fever, or given internally, checks excessive perspiration and lowers temperature. A wineglassful of Vinegar is useful to counteract the intoxicating effects of Alcohol.

The most ready and safe antidote in cases of poisoning by alkalis.

A hæmostatic in post-partum hæmorrhage.—*B.M.J.* '85, i. 56.

Recommended to prevent sickness after Chloroform, immediately replacing the inhaler by a linen cloth soaked in Vinegar, and allowing this to remain over the patient's face for at least three hours after the completion of the operation.—*B.M.J.E.* '95, ii. 63.

Dose.—1 fl. drm. to 1 fl. oz. = 3·6 to 28·4 c.c., diluted.

Incompatibles.—Ammonia, Lime, fixed Alkalis, and Carbonates.

Foreign Pharmacopœias.—Official in Austr., Belg., Fr., Ger., Hung. and Russ., 6 p.c. Acetic Acid; Dan., 4·7 p.c.; Ital., 5–6 p.c.; Port., 7–9 p.c.; Russ., 6 p.c.; Span., 6 to 8 p.c.; Swiss, 5 p.c.: all are without Sulphuric Acid; Mex., (Vinagre). Not in the others.

Tests.—Sp. gr. about 1·02. 10 c.c. should require for neutralisation not less than 8·2 c.c. Volumetric Sodium Hydroxide Solution corresponding to 4·8 p.c. Hydrogen Acetate. The neutralised liquid should yield a deep red coloration on the addition of a few drops of Ferric Chloride Test-solution, and should be free from empyreumatic odour or taste. Vinegar should yield no reaction when tested with Hydrogen Sulphide (absence of Lead, Copper, and Arsenic), and only the slightest reaction with Barium Chloride, Silver Nitrate, or Ferrous Sulphate solution (absence of more than traces of Sulphates, Chlorides, and Nitrates). The residue left on evaporation to dryness should be free from any signs of charring, and the ash remaining after ignition should be alkaline, indicating the absence of free Sulphuric Acid. The *P.G.* allows not more than 0·5 p.c. residue on evaporation, and this residue must leave an alkaline ash on incineration.

ACIDUM PYROLIGNEOSUM CRUDUM.—A brown liquid, having an odour of Tar and Acetic Acid, and containing about 6 p.c. of the latter. Deposits a tarry substance on standing some time. It is a good antiseptic.

Foreign Pharmacopœias.—Official in Austr., Ger., Jap., Norw., Russ. and Swiss. Not in the others.

A **Rectified Pyroligneous Acid** is also official in Dutch, containing 6 p.c. of Acetic Acid; Ger., 5 p.c.; Russ., 4·5 p.c.; Swiss, 5 to 5·4 p.c.

ACIDUM ACETICUM.

ACETIC ACID.

FR., ACIDE ACÉTIQUE; GER., ESSIGSAURE; ITAL., ACIDO ACETICO.

A clear colourless liquid, possessing an acetous odour, and containing 33 p.c. of Hydrogen Acetate, $\mathbf{HC_2H_3O_2}$, eq. 59·58.

It is produced during the destructive distillation of Wood, and by the oxidation of Ethyl Alcohol.

Medicinal Properties.—Rubefacient; skin parasiticide. A good application for ringworm. As a **gargle,** 15 minims to 1 oz. of Water. Diluted Acetic Acid is used for the same purposes as Vinegar.

Official Preparations.—Acidum Aceticum Dilutum. **Used in the** preparation of Liquor Ammonii Acetatis, Oxymel, and Oxymel Scillæ.

Incompatibles.—Ammonia, Lime, fixed Alkalis, and Carbonates.

Foreign Pharmacopœias.—Official in Jap., 36 p.c., sp. gr. 1·048; U.S., 36 p.c., sp. gr. 1·045 at 25° C. (77° F.); Norw., 30 p.c., sp. gr. 1·042; Dan., 29 p.c., sp. gr. 1·041; Dutch and Russ., 30 p.c., sp. gr. 1·041; Port. (Acido Acetico Hydratado), 38 p.c., sp. gr. 1·050; Fr., 50 p.c., sp. gr. 1·060; Swed., 25 p.c., sp. gr. 1·036.

The Acidum Aceticum of Belg., Fr., Ger., Span. and Swiss is practically Glacial; Belg. and Ger., 96 p.c., sp. gr. 1·064.

The Acidum Aceticum Dilutum of Austr., Ger., Hung. and Swiss more resembles *B.P.* Acidum Aceticum; Hung., 20 p.c.; Austr., Ger. and Swiss, 30 p.c.

Tests.—Acetic Acid has a specific gravity of 1·044, which corresponds with the *B.P.* figure; the *U.S.P.* gives 1·045 at 25° C. (77° F.); the *P.G.* Dilute Acetic Acid, which corresponds to the Acetic Acid *B.P.*, is required to possess a specific gravity of 1·041. The acid is required to contain 33 p.c. of absolute Acetic Acid, as indicated by titration with Volumetric Sodium Hydroxide Solution, 1 gramme of an acid of the official strength neutralising 5·5 c.c. of the Normal Solution. The *U.S.P.* acid is required to contain not less than 36 p.c. by weight of absolute Acetic Acid, a weighed portion of the acid being diluted with Water and an aliquot portion of the dilution titrated with Normal Volumetric Potassium Hydroxide Solution, the *U.S.P.* stating that Phenolphthalein Test-solution is to be used as an indicator of neutrality; the *P.G.* acid contains 30 p.c. w/w of pure acid. The exactly neutralised liquid yields on the addition of Ferric Chloride Test-solution a deep red coloration, and on boiling the liquid, a reddish-brown precipitate is thrown down; the red coloration is destroyed by Hydrochloric Acid. A portion of the neutralised liquid mixed with an equal volume of Sulphuric Acid, the mixture meanwhile being carefully kept cool affords when warmed, after the addition of a few drops of Alcohol (90 p.c.), a characteristic ethereal odour of Acetic Ether.

The more generally occurring impurities are empyreumatic matter, Sulphurous and Formic Acids, Arsenic, Copper and Lead, Chlorides and Nitrates and fixed impurities.

All three Pharmacopœias employ the Permanganate test for fixing a limit to the quantity of empyreumatic matter; the *B.P.* and the *U.S.P.* both employ 2 c.c. of the acid previously diluted with 10 c.c. of Water. The *B.P.* directs 1 drop of Potassium Permanganate Solution (1 p.c. w/v), and requires that after the lapse of half a minute the liquid shall still retain a shade of crimson; the *U.S.P.* adds 5 drops of Tenth-normal Volumetric Potassium Permanganate Solution, and requires that the liquid shall not become entirely free from pinkish-brown in less than half a minute. Both Pharmacopœias require that the Permanganate Solution shall not be immediately decolorised; the *P.G.* employs 20 c.c. of the acid and 1 c.c. of Potassium Permanganate Solution (0·1 p.c. w/w) requiring that the red coloration shall not disappear within 10 minutes. The ammoniacal Silver Nitrate test may be employed for the detection of Formic and Sulphurous Acid, 5 c.c. of the acid should yield no dark deposit when boiled for one or two minutes with 10 c.c. of Ammonia Solution and 5 c.c. of Volumetric Silver Nitrate Solution. The *B.P.* uses a solution of the acid exactly neutralised with Ammonia Solution; the *P.G.* does not include a test. A 1 in 10 dilution of the acid slightly acidified with diluted Hydrochloric Acid Solution shall give no coloration on the addition of Hydrogen Sulphide Solution, indicating the absence of Arsenic, Copper and Lead; the *P.G.* includes a specific test for Arsenic requiring that 1 c.c. of the acid and 3 c.c. of Stannous Chloride Solution shall not assume a dark coloration after the lapse of an hour. The presence of Copper is also shown when the liquid is slightly supersaturated with Ammonia Solution, the liquid assuming a bluish tint if that metal be present. A 1 to 10 dilution should not yield a precipitate or turbidity with Silver Nitrate Solution or with Barium Chloride Solution, indicating the absence of Chlorides and Sulphates. It should leave no residue when evaporated to dryness, indicating the absence of fixed impurities; this requirement is common to the *B.P.* and the *U.S.P.*

Volumetric Determination.—5 c.c. require 26 c.c. of Potassium Hydroxide Solution, *P.G.*; when 10 grammes are diluted with Water to 100 c.c., 59·6 c.c. of the dilution should require 36 c.c. of Normal V.S. of Potassium Hydroxide, Phenolphthalein Solution being used as an indicator, *U.S.P.*

Preparation.

ACIDUM ACETICUM DILUTUM. Diluted Acetic Acid.

Acetic Acid, 2½, diluted with Distilled Water, *q.s.* to yield 20.

Dose.—½ to 2 fl. drm. = 1·8 to 7·1 c.c.

Official Preparations.—Used in the preparation of Acetum Ipecacuanhæ, Acetum Scillæ, and Liquor Morphinæ Acetatis.

Foreign Pharmacopœias.—Official in Austr., Ger., and Swiss, 30 p.c. Acetic Acid, sp. gr. 1·041; Hung., 20 p.c.; Ital., A. A. Conc. 1, Water 4, sp. gr. 1·027; Belg., A. A. 3, Water 7; Jap. and Dutch, 6 p.c.; Port. (A. A. Aquoso), 10 p.c., sp. gr. 1·015; U.S., 6 p.c., sp. gr. 1·009 at 25° C. (77° F.); Mex., 3·63 p.c.; Fr., 10 p.c., sp. gr. 1·014. *See* also Acetum.

Tests.—Diluted Acetic Acid has a sp. gr. of 1·006 and is officially required to contain 4·27 p.c. by weight of Hydrogen Acetate, $HC_2H_3O_2$, eq. 59·58, as ascertained by titration with Deci-normal Volumetric Sodium Hydroxide Solution. Acetic Acid *B.P.* is used in the preparation of the diluted acid, which is therefore naturally required to answer the tests given under Acetic Acid. The Diluted Acetic Acid of the *U.S.P.* is required to contain not less than 6 p.c. w/w of absolute Acetic Acid; Diluted Acetic Acid *P.G.* corresponds very closely to the Acetic Acid *B.P.*

ACIDUM ACETICUM GLACIALE.

GLACIAL ACETIC ACID.

Fr., Acide Acétique Cristallisable; Ger., Essigsaure; Ital. and Span., *see* below.

A clear colourless liquid, having a pungent acetous odour. It crystallises in the cold, but again becomes fluid at temperatures above

15·5° C. (60° F.). It should contain 99 p.c. of Hydrogen Acetate. $HC_2H_3O_2$, eq. 59·58.

It is three times as strong as Acidum Aceticum, and nearly twenty-four times as strong as Acidum Aceticum Dilutum.

Solubility.—It **dissolves** Camphor, Gum-resins, Resins, and Volatile Oils. It mixes with Water and Absolute Alcohol.

Medicinal Properties.—Escharotic; used for corns and warts; it speedily vesicates, and thus is useful in cases where Cantharides may do harm by being absorbed, but it causes much pain, and if applied incautiously may produce a most troublesome sore. When scented, it is employed to fill vinaigrettes containing sponge or fragments of Potassium Sulphate.

Official Preparations.—Used in the preparation of Acetum Cantharidis Linimentum Terebinthinæ Aceticum, and Liquor Ferri Acetatis.

Not Official. — Acidum Aceticum Aromaticum, Acetum Aromaticum, Acetum Odoratum, Vinaigre Anglais, Vinaigre des Quatre Voleurs, Vapor Acidi Acetici, Acidum Trichloraceticum.

Antidotes.—Large quantity of Soap and Water to be swallowed; Lime Water, or Chalk and Water; Fluid Magnesia. Stomach-tube *not* to be used.—*Murrell.*

Foreign Pharmacopœias.—Official in Austr., Hung. and Swed. (A. A. Concentratum), Belg., Ger. and Swiss (Acidum Aceticum), Ital. (Acido Acetico Concentrato), Russ. (A. A. Glaciale), all 96 p.c., sp. gr. 1·064; Dutch (A. A. Concentratum), not less than 97·2 p.c.: Jap., 96 p.c., sp. gr. 1·056–1·064; Mex. (Acido Acetico Cristalizable), sp. gr. 1·063; Span. (Acido Acetico), 94–98 p.c., sp. gr. 1·060–1·067; U.S., sp. gr. not above 1·049 at 25° C. (77° F.), not less than 99 p.c.; Fr. (Acide Acétique), and Port. (A. A. Glacial), nearly 100 p.c. Not in the others.

Tests.—Glacial Acetic Acid melts at about 15° C. (59° F.). *B.P.* melting point and the strength of the acid as estimated volumetrically do not coincide. The official figure of 'above 60° F. (15·5° C.)' indicates, according to Rudorff's table, an acid containing 99·5 p.c., whereas the titration figure shows 98·9 p.c., corresponding to a m.p. of 58·6° F. (14·8° C.).

The author has pointed out (*P.J.* '02, ii 414) that the abstract of Rudorff's table given in *Pharmaceutical Journal*, [3] ii. 241, is incorrect. Rudorff's paper originally appears in 1870 in the *Berichte der deutschen chemischen Gesellschaft* (vol. 3, p. 390), which was copied into Wittstein's *Vierteljahresschrift für praktische Pharmacie*, 1871, band. xx. p. 84, and thence translated into the *Pharmaceutical Journal*. The figure given for an acid containing 0·497 p.c. of Water is incorrectly copied by Wittstein as 16·65° C., instead of 15·65° C., and the error has been perpetuated in the translation of the abstract given in the *P.J.*

It has a specific gravity of about 1·055; the *B.P.* states 1·058; the *U.S.P.* not above 1·049 at 25° C. (77° F.); the *P.G.* at most 1·064. The boiling point of the acid, official in the *U.S.P.* and the *P.G.* is 117° to 118° C. (242·6° to 244·4° F.). When exactly neutralised with Ammonia Solution it answers the tests with Ferric Chloride Test-solution and Sulphuric Acid and Alcohol (90 p.c.) characteristic of Acetates given under Acidum Aceticum. It is officially required to contain 98·9 p.c. w/w of absolute Acetic Acid as determined by titration with Volumetric Sodium Hydroxide Solution, 1 gramme diluted with 50 times its volume of Water neutralising 16·6 c.c. of the Volumetric Solution; the *U.S.P.* requires it to contain not less than 99 p.c. w/w of absolute Acetic Acid, mentioning that Phenolphthalein Test-solution is to be used as an indicator; the *P.G.* requires it to contain at least 96 p.c. w/w of absolute Acetic Acid. The two latter Pharmacopœias employ Normal Volumetric Potassium Hydroxide Solution for the titration, as shown in the small type below. Both the *B.P.* and the *U.S.P.* require the acid to answer the tests of purity given under Acidum Aceticum, the latter Pharmacopœia includes an additional recommendation, that in carrying out the Permanganate test 2 c.c. of the acid diluted with 10 c.c. of Water should be used, that two drops of Tenth-normal Volumetric Potassium Permanganate Solution should be added and that the tint produced should not be changed to brown within two hours.

The miscibility of Turpentine with an equal volume of Glacial Acetic Acid has been proposed as a test of strength of the latter (*P.J.* '99, ii. 201); but the author has shown (*P.J.* '02, i. 513) that an acid conforming strictly to the *B.P.* titration test cannot be expected to form a clear solution with all samples of Oil of Turpentine when mixed in equal volumes. It becomes, however, a delicate test for a strength of 99·5 p.c. acid or stronger.

Volumetric Determination.—Each 5 c.c. of a mixture of 1 part Acid and 9 parts Water by weight should require at least 8 c.c. Normal Volumetric Potassium Hydroxide Solution, *P.G.* 3 grammes of Acid are accurately weighed, diluted with 50 c.c. of Water, and titrated with Normal Volumetric Potassium Hydroxide Solution, Phenolphthalein T.S. being used as indicator, *U.S.P.*

Not Official.

ACIDUM ACETICUM AROMATICUM.—Glacial Acetic Acid, 72; Oil of Cloves, 9; Oil of Lavender, 6; Oil of Orange, 6; Oil of Bergamot, 3; Oil of Thyme, 3; Oil of Cinnamon, 1. All by weight; mix and filter.

This has been incorporated in the *B.P.C.* as follows—

Acidum Aceticum Aromaticum.—Oil of Bergamot, 2·50; Oil of Cinnamon, 1·25; Oil of Cloves, 10; Oil of Lavender, 5; Oil of Orange, 5; Oil of Thyme, 2·50; Glacial Acetic Acid, *q.s.* to produce 100.—*B.P.C.*

ACETUM AROMATICUM (*Ger.*).—Oils of Lavender, Peppermint, Rosemary, Juniper, and Cinnamon, of each 1; Oil of Lemon, 2; Oil of Cloves, 2; Spirit, 441; Diluted Acetic Acid, 650; Water, 1900. All by weight; digest 8 days, and filter.

Preparations containing similar ingredients but in different proportions are given in Austr., Fr., Hung., Ital., Jap., Mex., Norw., Port., Russ., Swed. and Swiss.

Acetum Aromaticum.—Eau de Cologne, 930; Tincture of Benzoin, 10; Glacial Acetic Acid, 60.—*Belg.*

Acetum Odoratum.—Oil of Bergamot, 0·50; Oil of Cassia, 0·10; Oil of Cloves, 0·30; Oil of Lavender, 0·20; Oil of Lemon, 0·50; Tincture of Balsam of Tolu, 1; Simple Tincture of Benzoin, 10; Alcohol (90 p.c.), 50; Glacial Acetic Acid, 4; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

VINAIGRE ANGLAIS.—Glacial Acetic Acid, 500; Camphor, 50; Oil of Cinnamon, 1; Oil of Cloves, 1; Oil of Lavender, ½. All by weight; mix.

VINAIGRE DES QUATRE VOLEURS.—Tops of the Greater and Lesser Wormwood (*Artemisia Absinthium* and *A. pontica*), Rosemary, Sage, Peppermint, Rue, and Lavender Flowers, of each 15; Calamus Root, Cinnamon, Cloves, Nutmeg, and Garlic, of each 2; Camphor, 4; Glacial Acetic Acid, 15; Strong White Vinegar, 1000. Dissolve the Camphor in the Glacial Acid; macerate the other ingredients in the Vinegar for ten days; press and mix.

VAPOR ACIDI ACETICI.—Glacial Acetic Acid and Acetic Acid, equal parts; mix. Two teaspoonfuls in a pint of Water at 140° F. for each inhalation. Sedative and antiseptic; used for inflammatory sore throat of scarlet fever.—*Throat.*

ACIDUM TRICHLORACETICUM.—A substitution product of Acetic Acid, but it is most readily prepared by acting on Chloral Hydrate with Nitric Acid in sunlight. Colourless, deliquescent crystals, which fuse at 55° C. (131° F.), and boil at 195° C. (383° F.).

Readily soluble in Water and in Alcohol (90 p.c.).

It is a powerful antiseptic and caustic. 1 or 2 p.c. solutions have been used as a dressing for wounds, and as a lotion and spray in acute coryza. Internally, in dilute solution, 2 to 5 grains for adults, ½ to 1 grain for children, in gastric catarrh and summer diarrhœa.—*L.M.R.* '83, 285; *T.G.* '85, 63; and '94, 349.

A test for albumen in urine.—*B.M.J.* '89, ii. 1114; and '90, i. 681.

Foreign Pharmacopœias.—Official in Dutch, Ger., Jap., Mex., Swiss, U.S.

ACIDUM ARSENIOSUM.

ARSENIOUS ANHYDRIDE.

B.P.Syn.—ARSENIC; WHITE ARSENIC; ARSENIOUS ACID.

FR., ANHYDRIDE ARSENIEUX; GER., ARSENIGESAURE; ITAL., ANIDRIDE ARSENIOSA; SPAN., ANHIDRIDO ARSENIOSO.

As_4O_6, eq. 393·28.

A heavy white odourless and tasteless powder, or white opaque and crystalline or glassy and amorphous masses, obtained from arsenical ores.

Solubility.—1 in 100 of cold Water; 1 in 20 of boiling Water; 1 in 500 of Alcohol (90 p.c.); 1 in 6 of Hydrochloric Acid; 1 in 8 of Glycerin; 1 in 11 of Solution of Potash; 1 in 40 of saturated solution of Sodium Carbonate.

These figures are approximate. The published solubilities of Arsenious Acid are very contradictory, owing, no doubt, to the specimens examined being either vitreous, opaque, or a mixture of the two, and therefore of different solubilities.

Medicinal Properties.—A general tonic and alterative. Valuable in chorea, chronic (not acute) eczema, lichen, acne and psoriasis, in gout and chronic rheumatism, in painful dyspepsia, in neuralgia and spasmodic asthma, especially if anæmic or malarial in origin; in the intervals between the attacks of angina pectoris; recommended in hay fever. Given in pernicious anæmia and allied blood diseases with good result. Indispensable in all forms of weak heart accompanied by pain. Antiperiodic in malaria; in small doses it is stimulant to nervous system. In the form of **paste** it is used to destroy the pulp before stopping carious teeth.

Small doses of Arsenic, from 3 to 5 minims of Fowler's Solution, well diluted, three times a day, the best tonic treatment of the rapid heart of influenza.—*L.* '99, ii. 1079.

Arsenical mixture for the removal of malignant tumours. Arsenious Acid, 1; Absolute Alcohol, 75; Aqua Dest. 75, increasing the strength of Arsenic to 1 in 100, or even 1 in 80.—*B.M.J.E.* '01, ii. 15.

Large doses in chorea. Fowler's Solution, 15 to 20 minims three times daily, reduced to 5 minims, and discontinued on the eighth day.—*B.M.J.* '01, ii. 1452.

Arsenic may be administered in solution, in pills, or by injection; injections are painful; Asiatic pills are much used on the Continent; but on the whole the advantages are all in favour of the time-honoured Fowler's Solution.—*L.* '03, i. 784; *B.M.J.* '03, i. 656.

Dose.—$\frac{1}{60}$ to $\frac{1}{15}$ of a grain = 0·001 to 0·004 gramme.

Ph. Ger. maximum single dose, 0·005 gramme; maximum daily dose, 0·015 gramme.

Prescribing Notes.—**In solution, tablet** *or* **pill.** *A good pill is made by well triturating with Milk Sugar and massing with 'Diluted Glucose.' Arsenic is usually given immediately after a meal. Solution of Arsenic is frequently prescribed with Solution of Strychnine; in such cases the (acid) Liq. Arsenici Hydrochloricus should be ordered, and not the (alkaline) Liquor Arsenicalis.*

Incompatibles.—Salts of Iron, Magnesia, Lime Water, and vegetable astringents.

Official Preparations.—Liquor Arsenicalis, Liquor Arsenici Hydrochloricus. Other preparations containing Arsenium: Arsenii Iodidum, Ferri Arsenas, Sodii Arsenas, Liquor Sodii Arsenatis and Liquor Arsenii et Hydrargyri Iodidi.

Not Official.—Liquor Ammonii Arsenitis, Pilula Asiatica, Granula Dioscoridis, Arsenical Paste, Arsenical Fibre, Arsenical Caustic Powders, Levico Water and La Bourboule Water. *See* also Liq. Auri et Arsenii Bromidi (*U.S.N.F.*), Sodium Cacodylicum, Arsenii Bromidi Liquor.

Antidotes.—The freshly-prepared moist Ferric Hydroxide, or large quantities of Calcined Magnesia; Dialysed Iron, followed by some Common Salt (to ensure precipitation of Ferric Hydroxide); Stomach-tube, Emetics; Mucilaginous drinks, Olive Oil, or Carron Oil; stimulants freely, if much prostration; warmth (hot blankets and bottles).

Antidotum Arsenici (*Belg.*, *Dan.*, *Dutch*, *Hung.*, *Ital.*, *Jap.*, *Port.*, *Russ.*, *Swiss* and *U.S.*).

They vary considerably in the quantities of Iron, Magnesia, and Water. Hung., Jap., Russ., Swiss and U.S. employ Ferric Sulphate; Belg., Dan., Dutch and Port. use Ferric Chloride.

U.S. formula (Ferri Hydroxidum cum Magnesii Oxido).—Mix 40 c.c. of Solution of Ferric Sulphate (sp. gr. 1·432) with 125 c.c. of Water, and keep the liquid in a large, well-stoppered bottle. Rub 10 grammes of Magnesium Oxide with cold Water to a smooth and thin mixture, transfer this to a bottle capable of holding about 1000 c.c., and fill it with Water to about three-fourths of its capacity. When the preparation is wanted for use, shake the Magnesium Oxide mixture to a homogeneous, thin magma, gradually add to it the diluted solution of Ferric Sulphate, and shake them together until a uniform smooth mixture results.

Note.—The diluted Solution of Ferric Sulphate, and the mixture of Magnesium Oxide with Water, should always be kept on hand, ready for immediate use.

Foreign Pharmacopœias.—Official in Belg., A. Arseniosum; Austr., Dan., Dutch, Ger., Hung., Jap., Norw., Russ., Swed. and Swiss, A. Arsenicosum; Fr., Ital.; Mex. and Port., Acido Arsenioso; Span.; U.S., Arseni Trioxidum.

Tests.—Arsenious Acid is distinguished by the following tests: (1) the microscopical appearance of the sublimate produced on heating a small quantity in a test-tube, brilliant transparent octahedral crystals being formed; (2) the pale yellow-coloured precipitate, soluble in Ammonia Solution and in Nitric Acid, which is thrown down when Silver Ammonio-nitrate Solution is added to its aqueous solution; (3) when dropped upon red-hot charcoal it produces the characteristic alliaceous odour of Cacodyl, and when gently heated with charcoal in a tube it is reduced, yielding a sublimate of Arsenic.

It is officially required to contain from 99·89 to 100 p.c. of pure Arsenious Anhydride as volumetrically determined by means of Deci-normal Volumetric Iodine Solution, a weighed quantity of 0·25 gramme of the acid being dissolved in Water by boiling it with five times its weight of Sodium Bicarbonate, the solution cooled, three drops of Hydrochloric Acid added to neutralise or to reconvert into Bicarbonate any Sodium Carbonate produced during the boiling. It should require from 50·8 to 50·9 c.c. of the Volumetric Solution.

The *U.S.P.* requires it to contain not less than 99·8 p.c. of pure Arsenic Trioxide; the *P.G.* not less than 98·32 p.c. of pure Arsenious Anhydride. It will be noticed from the small type below under the heading of Volumetric Determination that neither the *U.S.P.* nor the *P.G.* employ Hydrochloric Acid in performing the test. The necessity for the addition of Hydrochloric Acid is stated to be to neutralise or to reconvert into Bicarbonate any Sodium Carbonate produced during the boiling, but experiments made in the author's laboratory, using the *B.P.*, *U.S.P.* and *P.G.* processes, showed that it made very little difference whether the Hydrochloric Acid was added or not.

The more generally occurring impurities are mineral residue, Antimony, Cadmium, Lead, Tin and Arsenious Sulphide. The specimen should be entirely volatilised on heating, indicating the absence of mineral residue. The aqueous solution acidified with Hydrochloric Acid yields with Hydrogen Sulphide Solution a lemon-yellow precipitate; it should be completely soluble in Ammonium Carbonate Solution, indicating the absence of Antimony, Cadmium, Lead and Tin. It should dissolve entirely in about ten times its weight of Ammonia Solution, forming a colourless solution when diluted with Water; it should not assume a yellow colour when acidified with Hydrochloric Acid. The *B.P.* gives no quantities; the *U.S.P.* employs 1 gramme of the substance and 10 c.c. of Ammonia Solution; the *P.G.* 1 part of Arsenious Acid in 10 parts by weight of Ammonia Solution; the test indicates the absence of Arsenious Sulphide. The *U.S.P.* has an additional test for the absence of this latter impurity, and requires that the sublimate obtained on carefully heating the substance in a dry test-tube of hard glass should not at first show a yellow colour. The *U.S.P.* states that it may be distinguished from Arsenic Acid by the lemon-yellow precipitate produced on the addition of Silver Ammonio-nitrate Test-solution to its aqueous solution, this precipitate dissolving on the addition of Ammonia Solution and depositing metallic Silver when heated.

Volumetric Determination.—A weighed quantity of 0·1 of a gramme of Arsenic Trioxide mixed with 1 gramme of Sodium Bicarbonate dissolved by the aid of a gentle heat in 20 c.c. of Water should require for decolorising not less than 20·3 c.c. of Tenth-normal Volumetric Iodine Solution, *U.S.P.*; a weighed quantity of 0·5 of a gramme of the acid dissolved in 3 grammes of Sodium Bicarbonate and 20 c.c. of boiling Water is cooled and made up to 100 c.c. 10 c.c, of this solution should decolorise 10 c.c. of Deci-normal Volumetric Iodine Solution, *P.G.*

Preparations.

LIQUOR ARSENICALIS. ARSENICAL SOLUTION. *B.P.Syn.*—LIQUOR POTASSÆ ARSENITIS. FOWLER'S SOLUTION.

Arsenious Anhydride, 87½ grains; Potassium Carbonate, 87½ grains; Compound Tincture of Lavender, 5 fl. drm.; Distilled Water, *q.s.* to form 20 fl. oz. (1 in 100)

A clear red liquid possessing a Lavender odour and an alkaline reaction towards red Litmus paper. It contains 1 p.c. w/v of Arsenious Anhydride. The Liquor Potassii Arsenitis of the *U.S.P.* contains 1 p.c. w/w of Arsenic Trioxide; the Liquor Kalii Arsenicosi of the *P.G.* contains 1 p.c. w/w of Arsenious Acid. The *Brussels Conference* recommends a standard of 1 p.c. w/w.

It is officially directed to be prepared by dissolving 87½ grains each of Arsenious Anhydride and Potassium Carbonate in 10 fl. oz. of Water, but it is preferably prepared by dissolving this quantity of the solid ingredients in ½ oz. of the Water in a flask by the aid of heat, and diluting the solution to 10 fl. oz. with more of the Water; when cooled the compound Tincture of Lavender is added and the product diluted with sufficient Distilled Water to produce 20 fl. oz. The *U.S.P.* employs relatively about 2 fl. oz. for the purpose; the *P.G.* also uses a minimum amount of Water to first effect solution of the ingredients, subsequently diluting with Water to the required volume. The *P.G.* uses simple Spirit of Lavender and the preparation is colourless.

11 minims contain $\frac{1}{10}$ grain ; 1 c.c. = 0·01 gramme.

Dose.—2 to 8 minims = 0·1 to 0·5 c.c.

Larger doses are given in chorea.

Ph. Ger. maximum single dose, 0·5 gramme; maximum daily dose, 1·5 grammes.

An interesting account of the introduction of Fowler's Solution is given *C.D.* '04, ii. 685; also in *L.* '04, ii. 1472.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S., 1 Arsenious Acid in 100. All by weight.

Tests.—Liquor Arsenicalis has a specific gravity of 1·010 to 1·015. The *B.P.* gives no figure for the sp. gr. It is officially required to contain from 0·99 to 1·0 p.c. of Arsenious Anhydride, as determined by titration of the neutralised solution with Volumetric Iodine Solution, a faintly alkaline reaction being maintained throughout the titration by a slight excess of Sodium Bicarbonate. The *U.S.P.* dilutes 24·6 grammes of solution with Water to 100 c.c., acidifies the mixture very slightly with diluted Hydrochloric Acid, adds 2 grammes of Sodium Bicarbonate and titrates with Tenth-normal Volumetric Iodine Solution, of which it is required not less than 50 c.c. should be necessary. The *P.G.* mixes 5 c.c. of solution with 1 gramme of Sodium Bicarbonate and 20 c.c. of Water, and after the addition of a few drops of Starch Solution adds Tenth-normal Volumetric Iodine Solution; no permanent blue coloration should be produced by the addition of 10 c.c., but a permanent blue coloration should be produced on the further addition of 0·1 c.c of the Volumetric Iodine Solution.

LIQUOR ARSENICI HYDROCHLORICUS. HYDROCHLORIC SOLUTION OF ARSENIC.

Arsenious Anhydride, 87½ grains; Hydrochloric Acid, 2 fl. drm.; Distilled Water, *q.s.* to form 20 fl. oz. (1 in 100)

A clear colourless liquid possessing a strongly acid reaction towards blue Litmus paper. It contains 1 p.c. w/v of Arsenious Anhydride. and is thus of the same strength as Liquor Arsenicalis. The *U.S.P.* Liquor Acidi Arsenosi corresponding to this preparation contains 1 p.c. w/w of Arsenic Trioxide. The official directions for its preparation are to dissolve 87½ grains of Arsenious Anhydride and 2 fl. drm. of Hydrochloric Acid in 10 fl. oz. of Water by the aid of heat, subsequently diluting the solution to the required volume, but solution is more readily effected by dissolving the Arsenious Acid with the Hydrochloric Acid in 5 fl. oz. of Water by the aid of heat, and diluting the cool solution with sufficient Distilled Water to produce 20 fl. oz. The *U.S.P.* employs relatively about 5 fl. oz. of Water for this purpose.

11 minims contain $\frac{1}{10}$ grain; 1 c.c. = 0·01 gramme, Arsenious Anhydride.

De Valangin's Solution was ½ of this strength.

Dose.—2 to 8 minims = 0·1 to 0·5 c.c.

Tests.—Hydrochloric Solution of Arsenic has a specific gravity of 1·010 to 1·014; no figure for the specific gravity is given in the *B.P.* It is officially required to indicate 0·99 to 1·0 p.c. of Arsenious Anhydride as determined by the titration of 25 c.c. of the liquor with Volumetric Iodine Solution, sufficient Sodium Bicarbonate being added to ensure an alkaline reaction during titration; from 50·8 to 50·9 c.c. should be required. The *U.S.P.* employs a weighed quantity of 24·6 grammes of the solution, about 2 grammes of Sodium Bicarbonate, and 100 c.c. of Water; not less than 50 c.c. of Tenth-normal Volumetric Iodine Solution should be required.

LIQUOR ARSENII ET HYDRARGYRI IODIDI. *See* ARSENII IODIDUM.

ARSENAS FERRI. *See* FERRI ARSENAS.

ARSENAS SODII. *See* SODII ARSENAS.

ARSENATIS SODII LIQUOR. *See* LIQUOR SODII ARSENATIS.

Not Official.

LIQUOR AMMONII ARSENITIS is made of the same strength as Liquor Arsenicalis; Ammonium Carbonate being substituted for Potassium Carbonate.

PILULA ASIATICA.—Arsenious Acid, $\frac{1}{12}$ grain; Black Pepper, ¾ grain; for one pill.

The quantities vary in different books. *Gray's Supp.* gives Arsenious Acid, $\frac{1}{12}$ grain; Black Pepper, 1 grain. Swed. Pil. Acidi Arseniosi containing $\frac{1}{65}$ grain in each. *B.P.C.* gives the formula which was official in Dutch Supp. 1902, but which was omitted in Dutch 1905:—Arsenious Anhydride, $\frac{1}{16}$ grain; Black Pepper, $\frac{3}{4}$ grain.

Used in various chronic skin diseases.

GRANULA DIOSCORIDIS (*Fr.* and *Dan.*).—Each granule contains 1 milligramme of Arsenious Acid.

ARSENICAL PASTE for Dentists. — Arsenious Acid, 2; Morphine Sulphate, 1; Creosote, to make a stiff paste. A quantity of the size of a pin's head is ample for one application. It should be spread on Cotton-Wool and placed in the tooth. It will thus destroy the sensibility of a carious tooth, and in a few hours the tooth will be ready for stopping. Cocaine has been used in place of Morphine, but it is not so good.

ARSENICAL FIBRE for Dentists. — Arsenious Acid, 5; Tannin, 2; Morphine Sulphate, 5; make into a paste with Creosote, mix with Cotton-Wool, and dry. This preparation is an improvement on the paste, for the latter is apt to be squeezed out over the gum edge of the cavity and cause inflammation of the surrounding tissue.

ARSENICAL PASTE (Frère Côme's). — For cancer, applied after the surface has been laid bare by the application of Caustic Potash. Arsenic, 1; Charcoal, 1; Red Mercury Sulphide, 4; Water, *q.s.*

ARSENICAL CAUSTIC POWDERS.—Each contains from $\frac{1}{16}$ grain to $\frac{1}{8}$ grain of Arsenious Acid to 1 grain of Calomel, Vermilion or Antimony Sulphide, or of any combination of them.

La Bourboule Water contains about $\frac{1}{12}$ grain of Arsenious Anhydride in 20 fl. oz.

Levico Water (strong) contains about $\frac{1}{13}$ grain of Arsenious Anhydride in 20 fl. oz.

ACIDUM BENZOICUM.

BENZOIC ACID.

$HC_7H_5O_2$, eq. 121·13.

FR., ACIDE BENZOÏQUE; GER., BENZOESAURE; ITAL. and SPAN., ACIDO BENZOICO.

Light colourless, or almost colourless, feathery crystals, which are odourless or have a faint odour of Benzoin.

It should be preserved from the air and light in well-stoppered amber-tinted bottles and should be kept in a cool atmosphere.

B.P. and *U.S.P.* permit the use of synthetic Benzoic Acid, but Austr., Ger., Swiss and Swed. Pharmacopœias recognise only the Acid prepared from Benzoin.

The *B.P.* states that it is obtained from Benzoin by sublimation, or it may be prepared synthetically from Toluene, from Hippuric Acid, and from other organic compounds, from which it would appear that the authorities give a preference to the resin sublimed Acid, but their description, 'odourless when quite pure, but when obtained from Benzoin possesses an agreeable aromatic odour,' conveys an impression just the reverse of this.

The Commercial varieties of this Acid are:—

1. **Resin Sublimed Acid.**—Characterised by its strong empyreumatic odour, colour (varying from a pale yellow to light brown), and reducing action on both Permanganate Solution and ammoniacal Silver Nitrate; it may or may not contain Cinnamic Acid, according to the variety of the Benzoin from which it is made.

2. **Resin Precipitated Acid.**—This is prepared from Benzoin by one of the 'wet processes,' such as boiling with Milk of Lime to form a soluble Benzoate, which is afterwards decomposed by an Acid with separation of the slightly soluble Acid Benzoic. It is practically a pure chemical; has no empyreumatic odour; and has no reducing action either on Permanganate or ammoniacal Silver solution. This is the variety commonly sold as *B.P.* and is that intended to be used in the *U.S.*, the latter, however, will pass a sufficiently purified Acid, from whatever source derived.

3. **Hippuric Benzoic Acid.**—When imperfectly purified this Acid retains a distinct urinous odour, and is guarded against in most Foreign Pharmacopœias, but it has been shown (*P.J.* (3) xiv. 463) that acid from this source, after resublimation, will pass the purity tests of any Pharmacopœia, so that its use is mainly a question of price.

4. **Toluene Benzoic Acid.**—This is manufactured in very large quantities, principally for conversion into alkali Benzoates, but partly for sale as Benzoic Acid. In the latter case it is frequently said to be sublimed over a little Gum Benzoin to give it something of the aromatic odour of the Natural Acid. This Artificial Acid conforms with most tests, but is practically certain to be contaminated with Chlorine compounds, easily detected by mixing ½ gramme of the Acid with slaked Lime (free from Chlorine), damping with Water, igniting, dissolving the residue in Nitric Acid and adding Silver Nitrate Solution. A turbidity or precipitate is practical proof of the Toluene source of the Acid.

Solubility.—1 in 390 of Water; 1 in 12 of boiling Water; 1 in 2¾ of Alcohol (90 p.c.); 1 in 2¾ of Ether; nearly 1 in 6 of Chloroform; 1 in 12 of Benzol; about 1 in 30 of Glycerin. Borax increases its solubility in Water; 1 of Borax and 1 of Acid are soluble in 100 of Water; Sodium Phosphate also aids its solution. Soluble in aqueous solutions of the Caustic Alkalis and in hot Milk of Lime, forming Benzoates, from which it is precipitated on the addition of Hydrochloric Acid unless the solutions are very dilute.

Medicinal Properties.—Most useful in acidifying and disinfecting an alkaline and decomposing urine; a stimulating and disinfecting expectorant in chronic bronchitis and phthisis; an antipyretic in acute rheumatism.

The Sodium and Ammonium salts are preferable, as they are less irritating to the alimentary canal.

It is also useful in preventing fats from becoming rancid, and it is used as a food preservative.

Dose.—5 to 15 grains = 0·3 to 1 gramme.

Prescribing Notes.—*Given in* **cachets,** *in* **pills** *made up with 'Diluted Glucose' or in the form of Sodii Benzoas.*

Official Preparation.—Trochiscus Acidi Benzoici, ½ grain in each. Contained in Tinctura Camphoræ Composita, 2 grains in each oz.; Tinctura Opii Ammoniata, 9 grains in each oz. Used in the preparation of Ammonii Benzoas and Sodii Benzoas.

Not Official.—Vapor Acidi Benzoici, Benzoic Gauze, Anæsthesin, Subcutin.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—Pure Benzoic Acid melts at 121·4° C. (250·5° F.), the acid obtained from Benzoin at 120° C. (248° F.). The *U.S.P.* states 121·4° C. (250·5° F.) and mentions that the acid sublimed from Benzoin has a lower melting point. The *P.G.* does not include a melting point. The pure acid possesses a boiling point of 249° C. (480·2° F.), the acid prepared from Benzoin at 238·9° C. (462° F.). The carefully neutralised aqueous solution yields on the addition of Ferric Chloride Test-solution a buff-coloured precipitate. The *U.S.P.* and the *P.G.* adopt the following method of applying this test. The *U.S.P.* adds Ferric Chloride Test-solution diluted with 2 volumes of Water to the carefully neutralised solution of Benzoic Acid in an alkali Hydroxide Solution; the *P.G.* mixes 0·2 of a gramme of the acid with 20 c.c. of Water and 1 c.c. of Normal Volumetric Potassium Hydroxide Solution, and after shaking vigorously filters after 15 minutes and adds 1 drop of Ferric Chloride Solution to the filtrate. In the case of this acid the *B.P.* does not require it to yield 'when neutralised the reactions characteristic of Benzoic Acid.' The *U.S.P.* states that when heated in a dry test-tube with 3 parts of slaked Lime, Benzene is evolved. The acid may be readily determined by titration with Normal Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality, 1 c.c. of Normal Volumetric Sodium Hydroxide Solution corresponding to 0·12113 gramme of Benzoic Acid. The method for its determination in Compound Tincture of Camphor will be found under the heading of Tinctura Camphoræ Composita.

The more generally occurring impurities are mineral matter, Chlorobenzoic Acid, Cinnamic and Hippuric Acids. The *U.S.P.* includes a test for readily carbonisable organic impurities. Mineral matter, if present, is at once detected by a residue remaining after ignition. Chlorobenzoic Acid and Chlorine compounds (indicating when present the synthetic origin of the acid) are readily detected by the addition of Silver Nitrate Solution to the solution in Nitric Acid of the residue remaining after igniting the acid with twice its weight of Calcium Carbonate. The tests adopted by the *B.P.*, *U.S.P.* and *P.G.* are compared below in the small type paragraph headed Silver Nitrate. Potassium Permanganate and Diluted Sulphuric Acid and Potassium Permanganate Solution serve to detect Cinnamic and Hippuric Acids, and organic substances capable of reducing Potassium Permanganate Solution. The tests adopted by the *B.P.*, *U.S.P.* and *P.G.* for the detection of these substances are described in the small type paragraph under the heading of Potassium Permanganate.

The addition of Calcium Chloride Solution to a solution of the acid rendered faintly alkaline with Ammonia Solution should produce no turbidity or precipitate, indicating the absence of Oxalic Acid. The *U.S.P.* employs Sulphuric Acid to detect readily carbonisable organic impurities.

Silver Nitrate.—The solution obtained by dissolving in diluted Nitric Acid the residue left when 0·5 gramme of the Acid is heated with twice its weight of Calcium Carbonate in a closed vessel, should yield only the slightest cloudiness with Silver Nitrate Solution, indicating the absence of Chloro-Benzoic Acid, *B.P.* The quantities for this test given in the *P.G.* and *U.S.P.* are 0·2 gramme of Acid with 0·3 gramme of Calcium Carbonate, and 0·5 gramme of Acid with 0·8 gramme of Calcium Carbonate respectively. These Pharmacopœias direct that the Acid and Carbonate be mixed with a little Water and dried before ignition. The *P.G.* residue after ignition is dissolved in Nitric Acid and diluted to 10 c.c. with Water, while the *U.S.P.* residue is dissolved in 20 c.c. of Distilled Water with the aid of a slight excess of Nitric Acid, before the addition of the test reagent. The degree of opalescence permitted in the *U.S.P.* is not much more than that produced by a blank experiment with the same Calcium Carbonate as used in the test.

Potassium Permanganate.—A mixture of 1 part of the Acid and 1 part of Potassium Permanganate when warmed with 10 parts by weight of Diluted Sulphuric Acid, should not evolve the odour of Benzaldehyde (Bitter Almond Oil), *B.P.* The *P.G.* and *U.S.P.* tests are made with Water instead of Diluted Sulphuric Acid, and they direct that the mixture be gently warmed for a short time [45° C. (113° F.) for about 10 minutes, *U.S.P.*] in a loosely-stoppered test glass, and then cooled.

The colour of 2 drops of Potassium Permanganate Solution (1 p.c. w/v) should not be immediately destroyed by 0·2 gramme of the Acid suspended in 10 c.c. of Water, indicating the absence of Hippuric and Cinnamic Acids, *B.P.* A yellow to brownish cloudy solution should be obtained with 0·1 gramme Benzoic Acid and 1 c.c. Solution of Ammonia, from which Benzoic Acid is again precipitated on the addition of 2 c.c. of Diluted Sulphuric Acid; this acid mixture should almost completely decolorise 5 c.c. of Potassium Permanganate Solution (0·1 p.c.) after the lapse of 4 hours, *P.G.*

Sulphuric Acid.—On gently warming a solution of Benzoic Acid in pure cold Sulphuric Acid the colour of the solution should not become darker than light brown, and when poured into Water Benzoic Acid should separate, yielding a colourless liquid, indicating absence of readily carbonisable matter, *P.G.*

Preparation.

TROCHISCUS ACIDI BENZOICI. BENZOIC ACID LOZENGE.

½ grain of Benzoic Acid in each, with Fruit Basis.

Dose.—1 to 5 lozenges.

Not Official.

VAPOR ACIDI BENZOICI.—Benzoic Acid, 3 grains; Kaolin, 12 grains; rub together and add Water, ½ oz.; Tincture of Tolu, 18 minims. Shake and make up with Water to 1 oz.—*Throat.*

Extremely serviceable in sub-acute affections of the air passages.

BENZOIC GAUZE.—Contains 4 p.c. of Benzoic Acid.

ANÆSTHESIN (the Ethyl-ester of para-amido-benzoic acid).—A white, odourless powder, soluble 1 in 1200 of cold Water, soluble 1 in 6 of Alcohol (90 p.c.); and in Ether. Introduced as a local anæsthetic and as a substitute for Orthoform. Given in cases of gastric irritation.—*B.M.J.E.* '03, ii. 32. Insufflated, dusted on or used as an ointment, is most efficient (*B.M.J.* '05, ii. 1008) in allaying the pain of burns, ulcerative stomatitis, tuberculous and malignant ulceration, whether of the larynx or other regions, or it may be given internally up to 8 grains in gastric ulcer, carcinoma, or nervous dyspepsia.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme. Maximum daily dose, 40 grains = 2·6 grammes.

Subcutin (Anæsthesin paraphenol-sulphonate) is a product of greater stability.

ACIDUM BORICUM.

BORIC ACID.

B.P.Syn.—BORACIC ACID; HYDROGEN BORATE.

FR., ACIDE BORIQUE; GER., BORSAURE; ITAL. AND SPAN., ACIDO BORICO.

H_3BO_3, eq. 61·49.

Colourless and odourless pearly scales, or a fine, white, odourless powder, unctuous to the touch, and possessing a faintly acid and slightly bitter taste. It volatilises in the vapour of boiling Water. It is obtained by the decomposition of Borax with a mineral acid, preferably Sulphuric Acid, or by the purification of native Boric Acid.

Solubility.—1 in 25 of cold Water; 1 in 3 of boiling Water; 1 in 4 of Glycerin; 1 in 28 of Alcohol (90 p.c.); insoluble in Ether.

Medicinal Properties.—An unirritating local antiseptic and desiccant; it is used as a **dressing** for granulating and suppurating surfaces in general; as an **eye-wash,** 2 to 5 grains in an oz. of Water; as a **lotion, douche,** or as a **mouth-wash,** 10 to 15 grains to an oz. of Water; as a **paint** for the throat, 1 in 5 of Glycerin; as a **pessary,** 10 or 20 grains with Gelatin Mass or Oil of Theobroma.

Given internally in cystitis associated with decomposing urine.

Used as a **dusting powder** it prevents fetid perspiration.

Small doses internally to sterilise the urine, 48 hours before operation for stricture of the urethra.—*L.* '98, i. 1106.

As a *preservative*, a mixture with equal parts of Borax is more convenient than Boric Acid alone.

So-called danger from the use of Boric Acid in Milk. It is far from proved that small quantities of Boric Acid, if used for a long time, are poisonous to adults or children. Large doses are, however, not considered so innocuous.—*L.* '00, i. 13, 131, 574, 730.

Report of the Departmental Committee appointed to inquire into the uses of preservatives and colouring matters in foods; Boric Acid or mixtures of Boric Acid recommended to be recognised as a legal addition to cream, in amount not exceeding 0·25 p.c. expressed as Boric Acid; and in butter not exceeding 0·5 p.c. expressed as Boric Acid.—*L.* '01, ii. 1683; *J.S.C.I.* '01, 1228.

Report of evidence taken before the Departmental Committee.—*L* '99, ii. 1484, 1588, 1786, 1866; '00, i. 207, 279, 429, 507, 586, 1409; '00, ii. 276. Opinions differ as to the use of Boric Acid as a preservative of foods.—*L.* '03, i. 749, 837, 920.

Influence of Boric Acid on the metabolism of children. Neither Boric Acid nor Borax in any way affected the general health and well-being of the children. —*B.M.J.* '01, i. 1337; *J.C.S.* '01, *Abs.* ii. 517.

Influence of chemical preservatives of food on health. Extremely improbable that Boric Acid if used in proper proportions would cause any injurious effect whatever to the average adult, but because of certain possible injurious effects which might be produced, the use of such preserved milk for invalids and young children is to be condemned.—*L.*, '99, ii. 1427, 1577.

A record of 22 cases of toxic symptoms certainly caused by Boric Acid. General conclusion is that it is capable of producing dangerous pathological effects and ought not to be considered harmless.—*L.* '04, ii. 1817.

Use of Boric Acid and Borates in surgery and their internal administration, though usually free from danger, ought to be carefully guarded in patients suffering from kidney affections, and immediately discontinued should dermatitis or other toxic symptoms appear.—*L.* '99, i. 23.

Skin eruptions caused by the use of Boric Acid. Attention drawn to the possibility of fomentations or ointment as sources of toxic symptoms when applied to large areas of skin. Almost all the serious cases of toxic effects of Boric Acid have occurred where it had been locally applied to an absorptive surface.—*L.* '99, i. 261.

Toxic effects following the use of Boric Acid given internally, also, after irrigation with strong solutions. Erythema followed by dermatitis, which disappeared on discontinuing its use.—*B.M.J.* '99, i. 17, 209; *B.M.J.E.* '01, ii. 91; *L.* '01, ii. 1514.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Prescribing Notes.—*Can be given in* **mixture, powders,** *or* **cachets.**

Official Preparations.—Glycerinum Acidi Borici and Unguentum Acidi Borici.

Not Official.—Boric Acid dressings, Collyrium Acidi Borici, Collyrium Acidi Borici et Zinci Sulphatis, Lotio Acidi Borici, Mistura Acidi Borici, Pastillus Acidi Borici, Boro-Glyceride, Liquor Magnesii Boratis, Magnesii Borocitras, Pulvis Acidi Borici Comp., Pulvis Magnesiæ Borocitratis Comp.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—Boric Acid is distinguished by its behaviour with Turmeric paper, and the green coloration which it imparts to a non-luminous flame. The Turmeric test is conveniently performed by so immersing the Turmeric paper in the fluid to be tested that only one half becomes moistened; the fluid is evaporated on a water-bath, and any brownish-red colour produced is instantly noted; the paper can then be moistened with Ammonia Solution, and any further alteration in colour observed. In performing the 'flame' test, the *B.P.* uses 'Alcohol,' but it is preferable to employ purified Methylic Alcohol. The behaviour of Boric Acid towards the usual indicators of neutrality does not permit of its volumetric determination under ordinary circumstances, but in a solution containing not less than 30 p.c. of Glycerin the end reaction is quite definite with Phenolphthalein Solution. One gramme of Boric Acid should require for its neutralisation about 16·1 c.c. of Volumetric Sodium Hydroxide Solution equivalent to 99·0 p.c. of Hydrogen Borate. The *U.S.P.* has adopted the process recommended (*P.J.* '02, i. 345; *C.D.* '02, i. 660) for inclusion in the *B.P.*, and dissolves 1 gramme of the Boric Acid in 50 c.c. of Water after the addition of 50 c.c. of Glycerin, and states that it should require 16·2 c.c. of Normal Volumetric Sodium Hydroxide Solution, equivalent to at least 99·8 p.c. of Boric Acid. The *B.P.* does not mention a method of determination. When carefully heated Boric Acid fuses and swells up, and is finally converted into a transparent glassy hygroscopic mass. With slight modifications in the wording this statement appears in the *B.P.* and the *P.G.*, the former stating the loss of weight which should occur, namely 43·6 p.c.; the *U.S.P.* states that dehydration takes place at 100° C. (212° F.) with formation of Metaboric Acid, and on further heating it fuses at 160° C. (320° F.) to a glassy mass of Tetraboric Acid, and at a higher temperature loses all its Water and is converted into Boron Trioxide.

The more generally occurring impurities are Calcium, Copper, Lead, Iron and Magnesium; also Sulphates and Chlorides. Copper, Lead and Iron may be detected by the Hydrogen Sulphide test given in the small type below, Calcium and Magnesium by the Ammonium Oxalate or Sodium Phosphate test, Chlorides by the Silver Nitrate test and Sulphates by the Barium Chloride or Nitrate test each of which appears under its individual heading. The *B.P.* includes tests for Potassium, Sodium and Ammonium. The two former may be detected by the characteristic colours which they impart to a non-luminous flame, the latter by boiling a small quantity of the sample with Potassium Hydroxide Solution, when no ammoniacal odour should be perceptible, nor should the issuing vapour possess an alkaline reaction towards moistened red Litmus paper. The *U.S.P.* includes the modified Gutzeit test for Arsenic, but no special test for this substance appears in either *B.P.* or *P.G.* A test indicating a limit of Iron is included in the *U.S.P.* and *P.G.*, but not in *B.P.*; it is given in the small type below under the heading of Potassium Ferrocyanide. A figure of less than 10 parts per million has been suggested (*C.D.* '08, i. 795) as a fair limit for Lead, and there seems no reason for adopting a higher limit than 5 parts per million for Arsenic.

Litmus and Turmeric.—The aqueous solution reddens blue Litmus; Turmeric paper moistened with it and dried is coloured brownish-red, even in presence of Hydrochloric Acid. This brownish-red colour is changed to greenish-black (bluish-black, *U.S.P.*) by Alkali Hydroxide Solution (*B.P.* gives Potassium Hydroxide Solution; *U.S.P.* and *P.G.* give Ammonia Solution).

Flame Test.—The alcoholic solution when ignited imparts to the flame a greenish tinge (especially when the solution is acidulated with Sulphuric Acid, *B.P.*), *B.P.*, *P.G.* and *U.S.P.* Glycerin solutions also colour the flame green when ignited, *P.G.* and *U.S.P.*

Barium Chloride or Nitrate.—An aqueous solution (*P.G.* 1–50, *U.S.P.* 1–25) should not be affected by Barium Chloride Solution, *U.S.P.*; or by Barium Nitrate Solution, *P.G.*

Ammonium Oxalate or Sodium Phosphate.—An aqueous solution (*P.G.* 1 in 50, *U.S.P.* 1 in 25) should not be affected by Ammonium Oxalate Solution; or by Sodium Phosphate Solution in presence of Solution of Ammonia, *P.G.* and *U.S.P.*

Hydrogen Sulphide.—An aqueous solution (1 in 25) should not respond to the time-limit test for heavy metals, *U.S.P.*; Hydrogen Sulphide Solution should not affect an aqueous solution (1–50), *P.G.*

Potassium Ferrocyanide.—The *P.G.* and *U.S.P.* require that 0·5 c.c. Solution of Potassium Ferrocyanide should not immediately produce a blue colour with 30 c.c. of a 2 p.c. Solution of Boric Acid in 1 part of Hydrochloric Acid and 49 parts of Water.

Modified Gutzeit Test.—5 c.c. of an aqueous solution (1 in 25) should not respond to the modified Gutzeit test for Arsenic, *U.S.P.*

Preparations.

GLYCERINUM ACIDI BORICI.

6 of Boric Acid in powder, treated with 9 of Glycerin (by weight) at 302° F. (150° C.), until the whole is reduced to 10 by weight; it is then mixed with 10 of Glycerin.

If the liquid is kept constantly stirred, instead of only 'frequently' as officially ordered, the length of time required to complete the process is considerably reduced and the product is more likely to be a good colour. Boric Acid in crystals gives rather a lighter coloured product. It is too viscid for general use.

Foreign Pharmacopœias.—Official in Russ. (Acidum Boroglycerinatum); U.S. (Glyceritum Boroglycerini) 31 p.c.; Mex. (Glicerina Borica) 5 p.c. Not in the others.

UNGUENTUM ACIDI BORICI. Boric Acid Ointment

Finely powdered Boric Acid, 1; Paraffin Ointment, white, 9. (1 in 10)

The commercial 'Pulv. Subtil' contains coarse particles; before use it should be passed through a fine lawn sieve.

Foreign Pharmacopœias.—Official in Austr., Dutch, Fr. (Pommade d'Acide Borique), Mex., Norw. (Vaselinum Boricum), Span. and Swiss:—Boric Acid 1, Vaseline 9; Belg., Boric Acid 1, Simple ointment 9; Dan., Boric Acid 1, Washed Lard 9; Dan. has also Vaselinum Boricum, Boric Acid 1, Vaseline 9; Ger. and Jap., Boric Acid 1, Paraffin ointment 9; Swed., Boric Acid 1, Wool Fat 1, Vaseline 8; U.S., Boric Acid 1, Paraffin 1, White Petrolatum 8. Not in Hung., Ital., Port. or Russ.

Not Official.

COLLYRIUM ACIDI BORICI.—Boric Acid, 10 grains; Distilled Water, 1 oz.—*King's.*

COLLYRIUM ACIDI BORICI ET ZINCI SULPHATIS.—Boric Acid, 5 grains; Zinc Sulphate, ½ grain; Distilled Water, to 1 oz.—*Middlesex.*

Boric Acid, 1; Zinc Sulphate, 0·10; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

The *B.P.C. Supplement* now employs diluted Rose Water in place of Distilled Water.

LOTIO ACIDI BORICI.—Boric Acid, 15 grains; Water, 1 oz.—*St. Thomas's.* Boric Acid, 3; Water, 100.—*B.P.C.*

LINTEUM ACIDI BORICI.—Lint dipped in a hot saturated aqueous solution of Boric Acid and then dried. Should contain 50 p.c. of Boric Acid, and not be scaly. It is usually coloured pink.

Used as an antiseptic dressing for wounds and ulcers.

Boric Gauze, 20 p.c.; **Boric Wool**, 25–50 p.c. *Fr.* Gaze Boriquée, 10 p.c.

MISTURA ACIDI BORICI.—Boric Acid, 10 grains; Dilute Nitro-Hydrochloric Acid, 10 minims; Compound Tincture of Gentian, 1 drm.; Water, to 1 oz. —*Lock.*

PASTILLUS ACIDI BORICI.—2 grains in each pastille.

BORO-GLYCERIDE.—A patented preparation for preserving different kinds of food. A combination of Boric Acid and Glycerin.

A **solution**, 1 in 20 of Water, has been used as an antiseptic in operative surgery. Used as a **paint** in throat affections, 1 in 2 of Glycerin; as a **tampon** in dysmenorrhœa.

LIQUOR MAGNESII BORATIS.—*Light* Magnesium Carbonate, 4; Boric Acid, 27; Water, 128; boil and filter. They dissolve almost completely, but crystallise out within forty-eight hours. Half the quantity of Light Calcined Magnesia can be used in the place of the Carbonate.

MAGNESII BORO-CITRAS.—A white powder, or in glistening scales, prepared by the interaction of Boric and Citric Acids with Magnesium Oxide. Stated to be useful in the uric acid diathesis and for the removal of urinary calculi.—*L.* '03, i. 837, 920.

Inferior to Magnesium Lactate as a hæmostatic in hæmophilia.—*L.* '08, i. 96.

Dose.—15 to 30 grains = 1 to 2 grammes, several times daily.

Pulvis Magnesiæ Borocitratis Compositus.—Magnesium Borocitrate, 1; Powdered Sugar, 2.

Dose.—30 to 60 grains = 1·8 to 3·6 c.c.

PULVIS ACIDI BORICI COMP.—Boric Acid, 1; Zinc Oxide, 3; Starch, 6.—*Guy's.*

Boric Acid, 24; Potassium Bromide, 24; Starch, 99; Iodoform, 2; Morphine Acetate, 1. For insufflation.

Boric Acid and Starch Powder, equal parts.—*St. Thomas's* and *B.P.C.*

Listerine and **Zymocide** are liquid specialities containing Boric Acid together with other antiseptics.

Antipyonine, Aseptin, Branalcane, and **Glacialine** are preservative mixtures containing Boric Acid.

ACIDUM CARBOLICUM.

PHENOL.

C_6H_6O, eq. 93·34.

FR., PHÉNOL OFFICINAL; GER., KARBOLSAURE; ITAL., FENOLO CRISTALIZZATO; SPAN., ACIDO FENICO.

Small crystals which are colourless, but have a tendency to deliquesce and acquire a pink colour on exposure to light and air. Phenol has a characteristic odour and taste, and a strongly cauterising action upon the skin. The chief commercial source is the fraction of coal tar distilling between 150° and 200° C. (302° and 392° F.). It may also be synthetically prepared from Benzol, and is supplied commercially of very good quality. It should be kept in dark amber-coloured well-stoppered bottles.

Carbolic Acid, or Phenol, is prepared in a crude state by treating certain oils, heavier than Water, obtained in the distillation of Coal Gas Tar, with a dilute solution of Caustic Soda, and by subsequently separating the crude Carbolic Acid from the alkaline solution by the addition thereto of a mineral Acid (usually Sulphuric). The crude Carbolic Acid thus obtained is submitted to fractional distillation and crystallisation, with other purification processes, having for their object the entire removal of the last traces of Cresylic and other Tar acids and bases, Sulphur compounds, etc.

Solubility.—1 in 13 (or a little less) of Water; 1 in 2 of Olive Oil; 3½ in 1 of Glycerin; 3 in 1 of Chloroform; 4 in 1 of Ether; 6 in 1 of Alcohol (90 p.c.); 2¼ in 1 of Benzol; 2½ in 1 of Carbon Bisulphide; freely in Liquor Potassæ, in Liquor Sodæ, and in Volatile Oils.

The *B.P.* requires that at 60° F. (15·5° C.) 100 parts of Phenol should be liquefied by the addition of 10 parts of Water, should form a clear liquid with 30 to 40 of Water, and should be completely dissolved by 1200 of Water.

When 1 or 2 parts of melted Carbolic Acid are mixed with 1 of Water, the Acid separates on cooling in oil-like globules; but when 3, 4, 5, 6, 7, 8, and even 9 of Acid to 1 of Water are mixed, the solution is perfect at ordinary temperatures; when, however, the temperature sinks to 40° F. or under, the 8 and the 9 will crystallise out again.

Pure Carbolic Acid readily absorbs Water from the air, and combines with it to form a definite crystalline Hydrate $2C_6H_6O.H_2O$, containing 8·74 p.c. of Water and melting at 63° F. (17·2° C.).—*Allen.*

Medicinal Properties.—Antiseptic, disinfectant, and local anæsthetic. Given as an intestinal and gastric antiseptic in flatulence; and in dilated stomach with fermentative change; it is most efficacious in typhoid in the form of 1½-grain pills. It relieves the itching of psoriasis. It has been used with advantage internally in phthisis, bronchitis, gangrene of the lung, whooping-cough, and puerperal fever; as a prophylactic against scarlet fever. Placed in a carious tooth, or cautiously applied to the gum, relieves toothache. Used as a **paint** for the throat (30 grains to 1 oz. of Glycerin); as a **gargle** (2 grains to 1 oz.) for tonsillitis; if used with a **spray apparatus**, 3 grains in an oz. of Water; or for **inhalations**, 20 grains dissolved in a pint of hot Water; as an **injection** (1 grain to 1 oz. of Water), for the vagina or the bladder, as an antiseptic. Externally, used alone is a powerful caustic; as a **lotion** (15 to 30 grains to 1 oz.) for foul or syphilitic ulcers, carbuncles, scabies, ringworm and other parasitic skin diseases; (5 grains to 1 oz.) excellent for eczema and eruptions attended with itching; or as the official **ointment.** For a **mouth-wash,** *see* Phenate de Soude, p. 35.

Carbolic Oil, 1 or 2 in 40 of Olive Oil; used for dressing scalds and burns.

Carbolic Solution, 1 or 2 in 40 of Water; used in surgery as an antiseptic.

2 p.c. solutions have been used for **hypodermic injection.**

Deep hypodermic injections (½ grain to 20 minims Water) have been found most successful in erysipelas, poisoned wounds and deep-seated inflammations.—*Whitla.*

As solutions of Carbolic Acid in strong Alcohol or concentrated Glycerin are not caustic, but become so when diluted with Water, it is suggested that in cases of burning with concentrated Carbolic Acid it would be better to remove the Acid with strong Alcohol rather than with Water.—*P.J.* (3) xix. 783.

Actual contact would appear to be necessary for Carbolic Acid to act as a germicide. A few inches from the surface of pure Carbolic Acid in a bottle (open to the air) putrefaction and fermentation go on as rapidly as in the open air.—*P.J.* (3) ii. 545.

As an ointment or plaster (1 in 15 or 20) in lupus.—*M.A.* '94, 416.

Carbolic Acid mixed with 5 to 10 p.c. of Glycerin injected for hydrocele.—*B.M.J.* '86, i. 1164, 1214.

2 p.c. spray for erysipelas.—*B.M.J.* '86, ii. 947.

Injection of a 5 p.c. solution for anthrax.—*B.M.J.* '86, ii. 601; *L.* '87, ii. 1186; *L.M.R.* '89, 422; *M.A.* '94, 79.

1 grain in 1 oz. of Water every 4 hours for vomiting in pregnancy.—*L.* '89, i. 1121.

Enteric fever treated with Carbolic Acid.—*B.M.J.* '97, i. 1344.

Keratin-coated pills in acute diarrhœa.—*L.* '93, ii. 1305.

Hypodermically in the treatment of tetanus, 2 minims in 30 minims of Water injected 3 times a day.—*L.* '99, i. 1497; '99, ii. 1589; *B.M.J.E.* '99, i. 15; '00, i. 32.

Treatment of tetanus in horses by hypodermic injections.—*L.* '00, i. 538.

Treatment of influenza.—*L.* '99, i. 958; '00, i. 143, 509, 667, 1030.

The offensiveness of the pustular stage of eruption in smallpox successfully treated by the pure liquefied acid, applied with a small camel's-hair brush to the rash over a certain area of the body each day, commencing with the face and head, until the whole of the vesicles had been touched; care being taken to prevent the acid running on the healthy skin.—*L.* '03, i. 518; '03, ii. 1153, 1781.

In the treatment of plague, 12 grains given in a mixture every two to four hours.—*L.* '99, ii. 1589; '00, i. 614; '03, ii. 753.

Fixation of movable kidney by means of strong Carbolic Acid, six cases.—*L.* '02, i. 1142.

Treatment of erysipelas.—*B.M.J.* '02, i. 1142.

Cases of Carbolic Acid gangrene.—*T.G.* '01, 739; 132 cases of gangrene due to weak solutions of Carbolic Acid.—*Med. Review* '00, 449.

Treatment of vulvar vegetations with pure Carbolic Acid.—*T.G.* '01, 639.

A 5 p.c. solution failed to destroy anthrax spores after twenty-four hours' exposure; but destroyed the bacillus pyocyaneus, staphylococcus pyogenes aureus, and the bacilli of typhoid fever, diphtheria, cholera, and tuberculosis.—*London County Council's Report on Disinfectants, L.* '02, i. 758.

Carbolic Acid (5 p.c.) and Mercuric Chloride Solution (1 in 1000) proved to be the only real germicides for tubercle bacilli.—*Report of the London County Council on Disinfectants*, *L.* '02, i. 759.

Poisoning from the application of Carbolic Acid to the unbroken skin. A 2 p.c. solution being used as an application for pruritus, followed by the use on another day, after a bath, of a 4 p.c. solution applied to the abdomen, the thighs and the lumbar region. Recovery in ten days.—*L.* '02, i. 1551.

Alcohol stated to be one of the best antidotes in Carbolic Acid poisoning. The patient is made to drink promptly a few oz. of brandy, whisky, or other spirit. Immediately after this a soft india-rubber tube is passed through the œsophagus and into the stomach. A funnel is attached to the upper end and about a pint of Water (more or less, according to the circumstances) is poured into the stomach. The upper end of the tube is now depressed and the fluid is syphoned out. Washing the stomach is repeated two or three times, and finally 1 drm. Sodium Sulphate dissolved in a wineglassful of Water is given.—*Merck's Archives* (*December* '99) ; *L.* '00, i. 481 ; *T.G.* '01, 587 ; '01, 797 ; '02, 144 ; *P.J.* '00, i. 1 ; '02, ii. 85 ; *Squibb*, '01, 2563.

Bacterial standardisation of disinfectants.—In the 'drop' method of testing the bactericidal power of disinfectants, originated by Rideal and Walker, pure Phenol is recommended as the standard control disinfectant. It is employed in aqueous solution, and the proportion of absolute Phenol present should be determined by titration with Bromine as given under Tests. The method ascertains what dilution of the disinfectant under examination kills a given bacterial culture within the same time as the standard Phenol dilution. The quotient of the two dilutions indicates the efficiency of the disinfectant and is called its Carbolic Acid coefficient, or its Rideal-Walker coefficient. Thus if a 1 in 3000 dilution is found to be as germicidal as a 1 in 100 Phenol, the disinfectant is said to have a Phenol coefficiency of 30 ; that is, it possesses a germicidal power thirty times stronger than Phenol. In the routine testing of disinfectants the typhoid bacillus is generally used because of its medium resistance, its easy cultivation, and because it forms a good suspension ; but it is noteworthy that the coefficients of a disinfectant for different bacteria are not always identical.

The presence of organic matter has been found to exert an appreciable effect on the Carbolic Acid coefficients as determined by the Rideal-Walker method. Meredith Blyth is of opinion that disinfectants, containing the higher Phenols, suffer great loss of efficiency when mixed with fat, albumen, fæces and urine. The germicidal value of the disinfectant acting on a 'naked' organism gives little, if any, indication of its value in the presence of organic matter. It appears impossible in the Phenol class to combine a low toxic value with a high germicidal value in the presence of much organic matter.—*Analyst*, '06, 154.

Dose.—1 to 3 grains = 0·06 to 0·2 gramme.

Ph. Ger. maximum single dose, 0·1 gramme ; maximum daily dose, 0·3 gramme.

Prescribing Notes.—*Usually given internally in the form of a* **pill.** 12 *grains of Carbolic Acid make a good pill mass with* 24 *grains of Liquorice Powder ; another good formula is, Carbolic Acid* 12 *grains, Liquorice Powder* 18 *grains, Compound Tragacanth Powder* 6 *grains. Used in various forms as an application.*

Compressed tablets are supplied for extemporaneously preparing a solution.

The addition of free Ammonia to solution of Carbolic Acid slowly turns the colour blue, which darkens on keeping.—*P.J.* (3) xxi. 593.

Sulphurous Acid, added in very small proportion to Carbolic Acid melted, has been stated (*C.D.* '05, i. 859) to counteract the tendency of the acid to acquire a red tint.

Official Preparations.—Acidum Carbolicum Liquefactum, Glycerinum Acidi Carbolici, Suppositorium Acidi Carbolici, Trochiscus Acidi Carbolici, Unguentum Acidi Carbolici. Used in the preparation of Salol, Sodii Sulphocarbolas and Zinci Sulphocarbolas. Contained in Injectio Ergotæ Hypodermica and Liquor Thyroidei,

Not Official.—Anti-catarrhal Salts, Gargarisma Acidi Carbolici, Kraus's Catheter Lubricant, Lotio Acidi Carbolici, Lotio Acidi Carbolici et Boracis, Liquor Sodii Carbolatis, Mistura Acidi Carbolici, Lund's Oil, Oleum Lubricans, Pasta Lubricans, Pastillus Acidi Carbolici, Resina Carbolica, Vapor Acidi Carbolici, Antiseptic dressings, Carbolic Soap, Solution de Phenate de Soude, Acidum Carbolicum Crudum, Phenosalyl, Phenol Camphor, Phenol Iodatum, Pigmentum Phenol Iodati, Tribromphenol, Para-mono-chlorophenol, Trichlorphenol, Sulphaminol, Sulphocarbolic Acid and Sulphocarbolates.

Foreign Pharmacopœias.—Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital. (Fenolo cristalizzato), Jap., Mex. (Acido Fenico), Norw., Port., Russ., Span., Swed., Swiss and U.S.

Melting Point (Centigrade) compared with Foreign Pharmacopœias: Brit., 38·8°; Port., 35°; Dan., 39°; Fr., Span. and Swiss, 42°; Hung., 35°–44°; Ital., 40°; Mex., 40°; Norw., 40°; Austr., Belg., Dutch, Ger., Jap., Russ. and Swiss, 40°–42°; Swed., 39°; U.S., not lower than 40°.

Boiling Point (Centigrade) compared with Foreign Pharmacopœias: Austr., 178°–180°; Brit., not higher than 182°; Ital., 182°; Dutch, 181°–182°; Port. and Swed., b.p. not given; Fr., 182°; Belg., Ger., Jap., Norw. and Russ., 178°–182°; Hung., 180°–184°; Span., 186°; Swiss, 178°–184°; U.S., not higher than 188°.

Antidotes. — Stomach-tube, Emetics. Alcohol, Albumen, Saccharated Solution of Lime, soluble Sulphates (Magnesium or Sodium); Olive or Castor Oil; stimulants to counteract narcotism; warmth to the extremities. Hypodermic injection of Atropine Sulphate $\frac{1}{60}$ grain. Inhalations of Amyl Nitrite.

Case of Carbolic Acid poisoning by absorption treated successfully with 1-grain doses of Camphor (dissolved in Syrup) every hour for four hours.—*L.M.R.* '84, 217. 100 grammes of Camphorated Oil administered in case of Carbolic Acid poisoning: complete recovery.—*C.D.* '99, ii. 1055. Recovery after swallowing 3 oz. Carbolic Acid, treated by hypodermic injection of $\frac{1}{10}$ grain Apomorphine, Olive Oil and Lime Water being given freely.—*B.M.J.* '88, i. 1336; Soap.—*L.* '89, ii. 445. Vinegar neutralises the effects of Carbolic Acid on the skin and mucous membrane, and is useful when Carbolic Acid has been swallowed.—*L.* '96, i. 255; *Pr.* lvii. 220; *B.M.J.* '97, ii. 595.

Tests.—Carbolic Acid is distinguished by the following tests: (1) its melting point, (2) the boiling point, (3) its specific gravity at the melting point, (4) the production of a deep purple-violet colour when its aqueous solution is mixed with Ferric Chloride Test-solution, (5) the production of a white precipitate of Tribromphenol when an excess of Bromine Solution is added to its cold aqueous solution, and (6) the production of a bluish colour when 4 parts of its aqueous solution are mixed with 1 part of Ammonia Solution and a few drops of Chlorinated Soda Solution, and the mixture gently warmed.

The melting point is officially required to be not lower than 102° F. (38·8° C.). The melting point 91·5° F. (33° C.), given in *B.P.* 1885, was lower than that of any other Pharmacopœia; it has very properly been raised to a maximum of 102° F. (38·8° C.). It is possible with special precautions to raise the melting point of Carbolic Acid to 108° F. (42·2° C.); but the highest melting point commercially obtainable appears to be about 106° F. (41·1° C.), and no exception can be taken to a melting point of 104° F. (40° C.). The *P.G.* gives the melting point as 40° to 42° C. (104° to 107·6° F.); the *U.S.P.* requires that when Phenol is gently heated till liquid, then slowly cooled, with constant stirring until partial recrystallisation occurs, the semi-liquid mass formed should have a temperature (remaining stationary for some time) not lower than 39° C. (102·2° F.). A lower boiling point or a higher melting point indicates a less hydrated Phenol. The melting point and the boiling point are influenced by the presence of Water or Cresylic Acid, so that to eliminate the first it should be boiled for a few seconds and cooled. Starting with an acid melting at 104° F. (40° C.), 1 p.c. of added Water reduced the melting point to 98° F. (36·6° C.), 3 p.c. to 86° F. (30° C.), and 5 p.c. to 74° F. (23·3° C.).

The boiling point of the acid is about 180° C. (356° F.); the *B.P.* states not higher than 182° C. (359·6° F.); the *U.S.P.* and the *P.G.* 178° to 182° C. (352·4° to 359·6° F.). The acid has a specific gravity at its melting point of about 1·060; the *B.P.* states 1·060 to 1·066.

Lunge has shown (*P.J.* (3) xxii. 593), that the addition of 1·3 p.c. of Cresylic Acid to pure Phenol reduces the melting point from 40·5° C. (104·9° F.) to 32·5° C. (90·5° F.). The lower the melting point and the higher the boiling point, the more impure is the acid. The pure acid melts at 42° C. (107·6° F.), and boils at 182° C. (359·6° F.). A useful method of judging of the purity of a commercial acid is by determining the solidifying point of the 62·5 p.c. fraction, after the first 10 p.c. fraction containing the Water and light oils has been removed.

The aqueous solution of Phenol is faintly acid to blue Litmus paper. The *B.P.* states that it does not immediately redden blue Litmus; the *U.S.P.* that it is faintly acid to blue Litmus paper. An aqueous solution of Phenol yields a fine violet colour on the addition of Ferric Chloride Test-solution, the colour being pronounced even in very dilute solution. The *U.S.P.* gives quantities for this test, 1 drop of Ferric Chloride Test-solution to 10 c.c. of a 1 p.c. aqueous Phenol Solution yielding a violet-blue colour. The *P.G.* employs a solution of 20 parts of Phenol in 10 parts of Alcohol (90 p.c.) and states that when this solution is mixed with 1 part of Ferric Chloride Test-solution a dirty green coloration is produced, the solution when diluted with Water to 1000 parts assuming a nearly permanent light violet colour. Phenol even in dilute solution affords a white precipitate with Bromine Water. The test is common to the *B.P.*, *U.S.P.* and *P.G.* The *U.S.P.* states that the precipitate of Tribromphenol first formed is redissolved, but becomes permanent with more of the reagent, and that when examined under the microscope it appears crystalline. The *P.G.* directs a 1 in 50,000 solution of the Phenol to be employed, and states that the precipitate is flocculent.

Phenol coagulates Albumen Solution and Collodion, and forms a liquid with Camphor.

No process of assay has been introduced into the *B.P.* The Eighth Decennial Revision of the *U.S.P.* has adopted the Tribromphenol or Koppeschaar's process. The Phenol is precipitated as a Bromine compound by the addition of Bromine Solution and the excess of Bromine is determined by the addition of solution of Potassium Iodide (20 p.c.), and titration of the liberated Iodine with

Tenth-normal Volumetric Solution of Sodium Thiosulphate. The acid is required to show 96 p.c. of absolute Phenol. An outline of the process is given in the small type below under the heading of Volumetric Determination. The process originally recommended by Koppeschaar is given (*Zeitschrift für analitische Chemie*, xvi. 233), and consists in precipitating Phenol from its aqueous or dilute alcoholic solution with Bromine Water, the strength of the Bromine Water being determined by titration with Volumetric Sodium Thiosulphate and Potassium Iodide. The process is modified by Allen as follows:—A quantity corresponding to about 0·1 of a gramme of Phenol is carefully weighed and transferred to a stoppered bottle; to this is added a solution prepared by gradually adding Bromine to 7 c.c. of Normal Volumetric Sodium Hydroxide Solution until a permanent yellow colour appears, and then boiling the liquid. When cold a measured quantity of 5 c.c. of concentrated Hydrochloric Acid is rapidly introduced, the bottle stoppered and shaken. A solution of 1·25 grammes of pure Potassium Iodide is added, the bottle shaken and allowed to stand; the liberated Iodine is titrated with Deci-normal Volumetric Sodium Thiosulphate Solution, using Starch Mucilage as an indicator. In calculating out the result 7 c.c. of Normal Volumetric Sodium Hydroxide Solution neutralises 0·56 gramme of Bromine, all of which is liberated by Hydrochloric Acid. 0·1 of a gramme of Phenol requires 0·4068 gramme of Bromine, leaving a surplus of 0·1532 gramme, which would be sufficient to neutralise 19·5 c.c. of Deci-normal Volumetric Sodium Thiosulphate Solution, each c.c. of Volumetric Thiosulphate used over and above this indicates 0·00197 gramme of impurities in 0·1 gramme of the sample.

The more commonly occurring impurities are excess of Water and the presence of Cresylic Acid and Creosote. The presence of excess of Water is indicated by the lowering of the melting point, which may also indicate the presence of Cresylic Acid. The latter acid and Creosote are detected by the behaviour of a mixture of equal volumes of the liquefied acid and of the Glycerin when mixed with 3 volumes of Water. The *B.P.* and *U.S.P.* state that a clear liquid should be formed when 1 volume of Phenol liquefied by the addition of 10 p.c. of Water (8 p.c., *U.S.P.*) is mixed with 1 volume of Glycerin, and it is not rendered turbid when 3 volumes of Water are added.

Volumetric Determination.—The following process, which is a modification of that originally devised by Koppeschaar, is included in the *U.S.P.* A measured quantity of 25 c.c. (= 0·0389 gramme of Phenol) of a solution obtained by dissolving 1·556 grammes of the specimen in sufficient Water to produce 1000 c.c. is mixed in a glass stoppered bottle with 30 c.c. of Tenth-normal Volumetric Bromine Solution; 5 c.c. of Hydrochloric Acid added, followed by 5 c.c. of an aqueous Potassium Iodide Solution (20 p.c. w/v), rapidly introduced; the mixture is shaken, the stopper and neck of the bottle rinsed with a little Water, allowing the washings to run into the bottle, 1 c.c. of Chloroform added and the mixture well shaken. The liberated Iodine is titrated with Tenth-normal Volumetric Sodium Thiosulphate Solution, of which the number of c.c. used subtracted from 30 and the remainder multiplied by 4 yields the percentage of absolute Phenol present in the specimen operated upon.

Preparations.

ACIDUM CARBOLICUM LIQUEFACTUM. Liquefied Phenol. Liquefied Carbolic Acid.

Phenol, 10; Distilled Water, 1; by weight.

It forms a clear, colourless, highly refractive liquid possessing the characteristic odour of Phenol. It has a tendency to acquire a pinkish tint, and should therefore be preserved in well-stoppered dark amber-tinted glass bottles.

Dose.—1 to 3 minims = 0·06 to 0·2 c.c.

Foreign Pharmacopœias.—Official in Austr., Belg., Fr., Ger., Hung., Jap. and Russ., Carbolic Acid, 100; Water, 10. Dan., Ital., Norw., Span., Swed. and Swiss, Carbolic Acid, 90; Water, 10. Dutch, Carbolic Acid, 100; Water, 20; U.S., not less than 86·4 p.c. Not in the others.

A weak **Solution of Carbolic Acid** is official in the following Pharmacopœias.—Ital. (Aqua Phenicata), and Port. (Agua Phenica), 1 in 100, also 1 in 1000; (Aqua Carbolisata), Austr., Belg., Dutch and Ger., 1 in 50; Hung. (Aqua Carbolata), Mex. (Solucione de Acido Fenico), and Swiss (Aqua Phenolata), 1 in 100; Dan. (Solutio Phenoli), Fr. (Soluté de Phénol), Norw. (Solutio Acidi Carbolici) and Swed. (Solutio Phenoli), 1 in 50; Span. (Agua Fenicada), 1 in 50. The *Brussels Conference* adopted a strength of 2 p.c. w/w for Phenoli Solutio seu Aqua Phenolata.

Tests.—Liquefied Carbolic Acid has a specific gravity ranging from 1·064 to 1·069, a boiling point not higher than 182° C. (359·6° F.), and it should answer the tests of identity and purity given under Acidum Carbolicum.

When a small quantity of solution (say, 2 fl. drm., in a test-tube with a thermometer dipping into the solution) is cooled to about 10° C. (50° F.) and gently stirred, it becomes a mass of crystals, which will entirely disappear when the temperature rises to 14·4° C. (58° F.).

GLYCERINUM ACIDI CARBOLICI. Glycerin of Phenol.

Phenol, 1; Glycerin, sufficient to produce 5. (1 in 5)

Used as an antiseptic packing in cases of acute middle-ear catarrh, and has given good results.—*B.M.J.* '04, ii. 1210. A 10 p.c. aqueous solution of the acid with Cocaine affords relief of pain in non-suppurative middle-ear disease.—*B.M.J.* '04, ii. 1211.

Mixed with an equal bulk of Water, may be applied to aphthous stomatitis, or to ulcers in the mouth, or to inflamed tonsils. Mixed with 20 or 30 parts of Water, it makes an excellent gargle.

Foreign Pharmacopœias.—Official in U.S., 1 in 5; Mex., 1 in 50; Port., 1 in 100; Span., 1 in 100. Not in the others.

SUPPOSITORIA ACIDI CARBOLICI. Phenol Suppositories.

Each suppository contains 1 grain of Phenol, 2 grains of White Beeswax, and about 12 grains of Oil of Theobroma.

The addition of Wax to Oil of Theobroma raises the melting point of the mass without producing the required firmness. Suggested that future *B.P.* basis should be Theobroma alone.—*P.J.* '00, ii. 85.

TROCHISCUS ACIDI CARBOLICI. PHENOL LOZENGE.

1 grain of Phenol in each, flavoured with Tolu.

Dose.—1 to 3 lozenges.

UNGUENTUM ACIDI CARBOLICI. PHENOL OINTMENT. OINTMENT OF CARBOLIC ACID.—*B.P.* '85.

Phenol, 1; Glycerin (by weight), 3; white Paraffin Ointment, 21. (1 in 25)

In *B.P.* '85 ointment, part of the Phenol crystallised on keeping, and acted as a caustic. To avoid this the Phenol is now dissolved in Glycerin.

Attention has been directed (*L.* '05, i. 514) to the tendency of the *B.P.* **Ointment** to crystallise, and a modified formula suggested:—Phenol, 1; Hard Paraffin, 6; Soft Paraffin, 18. This formula is stated to be superior to the official one, and to be recommended especially for obstetric use. The desirability is also suggested of inserting alternative formulas for ointment bases in the *B.P.* According to Hallberg, ointment bases may be classed into: (1) Non-absorbent protective epidermatic bases, *e.g.*, Hard and Soft Paraffin; (2) Emollient absorbent endermatic bases, *e.g.*, Lard and Olive Oil; (3) Systematic absorptive diadermatic bases, *e.g.*, Wool Fat.

The ointment made according to the directions contained in the British Pharmacopœia has been the subject of a good deal of discussion from time to time, some authorities holding that even now it is not a satisfactory product, whilst others hold that it is. According to *P.J.* '06, i. 344, the formula as it stands has been well designed, and it produces an excellent ointment.

The *B.P.* 1885 ordered Carbolic Acid 1, Soft Paraffin 12, Hard Paraffin 6 = 1 in 19. The *Companion* noted the fact that the Carbolic Acid did not dissolve until the melted mixture was heated to 60° C. (140° F.) or over, and that part of the Carbolic Acid crystallised on keeping the ointment, but no crystals were formed when the strength was reduced to 1 in 30. The *U.S.P.* has now been altered to 3 in 100, and this has been incorporated in the *B.P.C.* under the title **Paraffinum Carbolisatum.**

Foreign Pharmacopœias.—Official in Fr. (Pommade de Phénol), Phenol 1, Vaseline 99; Ital. (Pomata Fenata), Carbolic Acid 1, Benzoated Lard 99; Mex. (Pomada de Acido fenico), Carbolic Acid 1, Alcohol 1, Vaseline 98; U.S. (Unguentum Phenolis), Phenol 3, White Petrolatum 97. Not in the others.

Not Official.

ANTI-CATARRHAL SALTS.—Phenol, 1; Eucalyptus Oil, 1; Pumilio Pine Oil, ½; Strong Iodine Solution, ½; Camphor, 1; Ammoniated Alcohol, 2; Pine Sawdust, 2, or *q.s.*—*Martindale.*

This has been incorporated in the *B.P.C.* under the title **Vapor Eucalypti Compositus** with the *syn.* Anti-catarrhal Salts.

GARGARISMA ACIDI CARBOLICI.—Glycerin of Phenol, 1 fl. oz.; Water, to 1 pint.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

Glycerin of Carbolic Acid, 25 minims; Water, to 1 fl. oz.—*London.*

LOTIO ACIDI CARBOLICI.—Carbolic Acid, 30 grains; Water, 8 oz. This lotion applied to mosquito bites relieves the itching, pain, and swelling. If mixed with a little Glycerin and sponged over the face and hands before retiring to rest, the mosquitoes will not bite until the Acid be thoroughly evaporated by the heat of the skin.—*L.* '78, ii. 280.

See also Foreign Pharmacopœias under 'Acidum Carbolicum Liquefactum.'

Lotio Acidi Carbolici.—Carbolic Acid (crystals), 1 oz.; Water, to 20 fl. oz.—*London.*

Liquefied Carbolic Acid, 24 minims; Water, to 1 oz.—*Westminster.*

Phenol Crystals, 1; Water, to 20. Usually diluted with Water before use, as an antiseptic in surgery.—*B.P.C.* *See* also **Carbolic Solution,** p. 28.

LOTIO ACIDI CARBOLICI ET BORACIS.—Glycerin of Phenol, 2 fl. oz.; Glycerin of Borax, 2 fl. oz.; Water, to 1 pint. To be diluted with five to ten parts of Water.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

Lotio Boracis cum Acido Carbolico.—Bicarbonate of Sodium, 20 grains; Borax, 20 grains; Glycerin of Carbolic Acid, 1 fl. drm.; Distilled Water, to 1 oz. —*Royal Free.*

Lotio Acidi Carbolici cum Borace.—Glycerin of Carbolic Acid, 6 minims; Glycerin of Borax, 6 minims; Water, to 1 oz.—*Children's Hospital,* G.O.S.

MISTURA ACIDI CARBOLICI (*Rothe*).—Pure Carbolic Acid, 12 minims; Tincture of Iodine, 16 minims; Tincture of Orange, 90 minims; Syrup, 3 drm.; Water, to 8 oz. Recommended for use in typhoid fever; 1 oz. every 4 hours.—*L.* '88, i. 1244.

LUND'S OIL.—Phenol, 1; Castor Oil, 4; Almond Oil, 20.—*Lock.*

Phenol, 1; Castor Oil, 4; Almond Oil, 15.—*Companion* (1899).

This has been incorporated in the *B.P.C.* under the title **Oleum Lubricans.**

A solution of Carbolic Acid in Oil is frequently used to lubricate and at the same time disinfect catheters; but Koch's experiments show that such a solution has no antiseptic power, and they ought to be first disinfected with an aqueous solution, and afterwards oiled.—*Brunton.*

Kraus's Catheter Lubricant.—Tragacanth, 2·5; Glycerin, 10; Phenol Water (3 p.c.), 90.

This paste facilitates the passage of the catheter and is easily washed off in warm Water.—*P.J.* '99, ii. 529.

This has been incorporated in the *B.P.C.* as under:—

Pasta Lubricans. *Syn.* Catheter Paste.—Carbolic Acid, 3; Glycerin, 10; Tragacanth, 2·50; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

PASTILLUS ACIDI CARBOLICI.—Carbolic Acid, ½ grain; Glycogelatin, 18 grains in each.

RESINA CARBOLICA.—Resin, 4; Carbolic Acid Crystals, 4; Chloroform, 3.—*R.D.H.*

Resin, 45; Carbolic Acid, 35; Chloroform, 20.—*B.P.C.*

VAPOR ACIDI CARBOLICI.—Pure Carbolic Acid, 420 grains; Water, 1 drm.; dissolve. 20 drops in a pint of Water at 140° F. for each inhalation. Antiseptic, very serviceable in syphilitic and carcinomatous ulcerations.

CARBOLIC ANTISEPTIC DRESSINGS.—Absorbent **Wool** and **Lint** containing 5 and 10 p.c. of absolute Phenol; **Gauze,** 5 p.c. **Tow,** 5 p.c., **Ligatures; Protective** Oiled Skin; Silk **Sutures.** Fr. (Gaze Phénolée), 2 to 5 p.c.; Belg., Gauze, 5 p.c.; Jap., Cotton-Wool, 5 p.c.; Ital., Gauze, 5 p.c.; Wool, 2 p.c.; Mex., Gauze, 10 p.c.; Stupa Carbolisata (*B.P.C.*), Carbolic Acid, in crystals, 5; Methylated Ether (0·720), 100; Jute Tow, dried, 95; Stupa Carbolisata Composita (*B.P.C.*), Jute Tow, dried, 86; Tar, 4; Carbolic Acid, 10; Methylated Ether, 100.

CARBOLIC SOAPS.—These contain 10 p.c. and 20 p.c. of Phenol.

SOLUTION DE PHENATE DE SOUDE.—Phenol, 100; Solution of Caustic Soda (sp. gr. 1·332), 20, by weight; Water to measure, 1000.—*Fr.*

One part of this solution to 30 of Water makes a good **antiseptic mouth-wash.**

Liquor Sodii Carbolatis.—Phenol, 8; Caustic Soda, 3½; Distilled Water, 100.—*Martindale.*

Liquor Sodii Carbolatis. *Syn.* Solution of Sodium Phenate.—Carbolic Acid, 8; Sodium Hydroxide, 4; Glycerin of Cochineal, 1; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

A formula is given (*A.J.P.* '90, 169) as representing the proprietary article sold under the name 'Phénol Sodique': Coal-tar, 2 troy oz.; Soda, 120 grains; Water sufficient to make 20 fl. oz.

ACIDUM CARBOLICUM CRUDUM.—A yellowish, yellowish-brown, or reddish-brown liquid, having a strongly empyreumatic and disagreeable odour. It consists chiefly of **Cresylic Acid** (*see* p. 42), and is largely used for disinfecting drains, etc.

Foreign Pharmacopœias.—Official in Hung., Ital., Jap. and Russ. Not in the others.

PHENOSALYL.—A speciality containing Phenol and Salicylic Acid introduced as an antiseptic.

PHENOL-CAMPHOR.—Carbolic Acid and Camphor will form a liquid in any proportion between Camphor 3, Carbolic Acid 1 and Camphor 1, Carbolic Acid 3; but most authorities appear to use an excess of Camphor. The formula $C_8H_{11}O$, attributed to this compound, corresponds with molecular weights of each, Carbolic Acid and Camphor (Carbolic Acid 2 parts, and Camphor 3 parts).

A colourless refractive liquid with an odour of Camphor. Soluble in Alcohol (90 p.c.), Ether, Chloroform, and Oils. Insoluble in Glycerin and in Water.

Used as a local anæsthetic for toothache.—*T.G.* '85, 269; *L.* '89, ii. 867.

Camphor, 60; Phenol, 19; Water, 1; is not so caustic as Carbolic Acid.—*Pr.* xl. 128, and xlii. 52.

Acidum Carbolicum Camphoratum (*Hager*).—Camphor, 3; Carbolic Acid, 1.

This has been incorporated in the *B.P.C.*

Camphora Carbolisata (*Hager*). — Camphor, 25; Carbolic Acid, 9; Spirit, 1.

Carbolic Acid 1, Camphor 3, has been applied in diphtheria, etc., either pure or mixed with an equal volume of Oil of Almonds.

PHENOL IODATUM (Iodised Phenol. Pigmentum Phenol Iodati).—Iodine, 40 grains; Liquefied Carbolic Acid, 1 oz.—*Hosp. Women*, and *Samaritan.*

Applied on a dressed sound or forceps in chronic endometritis and endocervicitis, with or without a previous curetting. A fl. drm. diluted with 20 oz. of Water is used as a vaginal douche in midwifery.—*L.* '88, ii. 862.

Iodine, 10; Liquefied Carbolic Acid, to make 100.—*B.P.C.*

Pigmentum Iodi Carbolicum.—Iodine, 1; Liquefied Phenol, 4.—*Guy's.*

Pigmentum Iodi Carbolisatum.—Iodine, Potassium Iodide, and Phenol, of each 4 grains Glycerin, ½ oz.; Water, to 1 oz.—*Central Throat.*

This is sometimes used at half strength.

It has been incorporated in *B.P.C.* as follows:—Iodine, 1; Potassium Iodide, 1; Phenol, 1; Glycerin, 50; Distilled Water, *q.s.* to produce 100.

TRIBROMPHENOL (Bromol).—White crystalline powder, with a slightly aromatic odour. A sample melted at 185° F. (85° C.).

Solubility.—1 in 2 of Alcohol (90 p.c.); 1 in 1 of Ether; 1 in 2 of Chloroform; almost insoluble in Water, but dissolves in Caustic Alkaline Solutions; 1 in 260 of Glycerin; 1 in 7½ of Olive Oil.

It possesses considerable antiseptic properties.

PARA-MONOCHLOROPHENOL.—Occurs in crystalline needles. Soluble in Alcohol, Ether, and Fixed Oils, but practically insoluble in Water. It possesses a stronger microbicidal power than Phenol, but its employment requires careful watching.—*B.M.J.E.* '95, i. 11; *P.J.* '95, ii. 551; '98, i, 61; *C.D.* '95, i. 224.

5 or 10 p.c. Glycerin solution in laryngeal phthisis, by intralaryngeal injection, also ¼ to ½ p.c. solutions for inhalations. Under the name of **Menthosol,** a mixture of Menthol and Parachlorophenol in 5, 10 and 15 p.c. solutions has been introduced.—*B.M.J.E.* '02, i. 43.

TRICHLORPHENOL.—White crystalline powder, with a pungent, somewhat tarry odour.

Solubility.—1 in 1 of Alcohol (90 p.c.); 2 in 1 of Ether; 1 in 1¼ of Chloroform; 1 in 1000 of Water; 1 in 9 of Glycerin; 1 in 3 of Olive Oil.

It forms salts with Ammonium, Potassium, Magnesium, Calcium and Lead.

It is stated to be an antiseptic and deodorant much stronger than Carbolic Acid.

SULPHAMINOL (Thio-oxydiphenylamine).—Yellow, odourless, tasteless powder. Insoluble in Water, soluble in Alcohol and Ether. Antiseptic dusting powder. Internally in doses of 3 to 4 grains = 0·2 to 0·36 gramme, three or four times a day in cystitis.

SULPHOCARBOLIC ACID ($H.C_6H_5SO_4$).—Phenol-para-sulphonic Acid is formed by the action of Sulphuric Acid upon Carbolic Acid when warm. Phenol-ortho-sulphonic Acid is produced in the cold.

A few years ago it was revived under the name **ASEPTOL**, a syrupy liquid, mixing in all proportions with Water, Alcohol, and Glycerin.

AMMONIUM, MAGNESIUM, POTASSIUM, and **SODIUM SULPHOCARBOLATES** all crystallise in tufts of acicular crystals more or less white; **COPPER SULPHOCARBOLATE**, in transparent light blue interlacing prisms; the **IRON** salt, in small brown micaceous crystals; the **ZINC** salt, in tabular crystals.

The Sodium and Zinc Sulphocarbolates are official. *See* SODII SULPHOCARBOLAS and ZINCI SULPHOCARBOLAS.

ACIDUM CHROMICUM.

CHROMIC ANHYDRIDE.

CrO_3, eq. 99·38.

FR., ACIDE CHROMIQUE CRISTALLISÉ; GER., CHROMSAURE; ITAL., ANIDRIDE CROMICA; SPAN., ACIDO CROMICO.

Small purplish-red crystals, which are slightly hygroscopic even when absolutely free from Sulphuric Acid, but much more so when a trace of the latter is present. They possess a strong corrosive action on animal and vegetable tissues.

It should be kept in well-stoppered, dark amber-tinted glass bottles.

It is produced by the action of Sulphuric Acid upon Potassium Bichromate.

Solubility.—About 2 in 1 of Water; Alcohol decomposes it.

It is a powerful oxidising agent, and is liable to cause sudden combustion or *explosion* in contact with strong Alcohol, Ether, Glycerin, and some other organic matters.

Medicinal Properties.—Disinfectant, antiseptic, deodorant. It is a powerful caustic (1 in 1 of Water), and is used by means of a pointed glass rod, great care being taken to protect the adjacent parts by plaster or ointment, having moist lint ready to absorb any superfluous Acid; 100 grains to 1 oz. Water is used to remove warts, lupus, and condylomata; 1 in 40 of Water may be applied to ulcers of mouth or pharynx; and 1 in 2000, or even 4000, is used as a lotion for putrid sores, leucorrhœa and ozœna.

It is of great importance for its use as a caustic that Chromic Acid should be free from Sulphuric Acid.

A warm concentrated solution rapidly dissolves all animal tissues.

5 p.c. Solution of Chromic Acid applied with a brush to the feet after bathing gave excellent results in the German Army as a remedy for excessive perspiration.—*P.J.* (3) xx. 504.

The pure Acid fused on the point of a probe has been applied with success to nasal mucous membrane in cases of hay fever and paroxysmal sneezing.—*M.A.* '94, 317.

Official Preparation. Liquor Acidi Chromici.

Not Official.—Gargarisma Acidi Chromici, Lotio Acidi Chromici and Pigmentum Acidi Chromici.

Foreign Pharmacopœias.—Official in Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex. (Acido Chromico), Norw., Port., Russ., Span., Swed., Swiss and U.S. (Chromii Trioxidum).

Tests.—Chromic Acid is distinguished by its melting point, which should be from 192° to 193° C. (377·6° to 379·4° F.), the *B.P.* gives 192° C. (377·6° F.) the *U.S.P.* 192° to 193° C. (377·6° to 379·4° F.), whilst the *P.G.* does not include a melting point; the production of green coloured liquids when its aqueous solutions are mixed with reducing agents, the evolution of Oxygen when strongly heated, and the evolution of Chlorine when warmed with Hydrochloric Acid. It liberates Iodine from Potassium Iodide Solution, and this reaction has been utilised by the *U.S.P.* as a means of determining the percentage of Chromic Anhydride. The Iodine liberated when the specimen is treated with an excess of Potassium Iodide, in a solution acidified with Hydrochloric Acid, being titrated with Tenth-normal Volumetric Sodium Thiosulphate Solution; it is required to contain not less than 90 p.c. of pure Chromium Trioxide.

The more generally occurring impurity is Sulphuric Acid, which is tested for, in an acidified solution, by Barium Chloride Solution, only a slight opalescence should be afforded.

Barium Chloride or Nitrate.—An aqueous solution 1 in 50 (1 in 100 *P.G.* and *U.S.P.*) previously acidulated with Hydrochloric Acid. Should be unaffected by Barium Chloride Solution. (*P.G.* uses Barium Nitrate Solution.) This test is common to *B.P.*, *P.G.* and *U.S.P.*; the *B.P.* test permits a slight opalescence.

Volumetric Determination.—A weighed quantity of 1 gramme is dissolved in 100 c.c. of Water. A measured quantity of 8·3 c.c. of this solution is mixed with 2 c.c. of Hydrochloric Acid and about 1 gramme of Potassium Iodide and diluted with 100 c.c. of Water. The Iodine liberated should require not less than 22·5 c.c. of Tenth-normal Volumetric Sodium Thiosulphate Solution to decolorise it, using 5 c.c. of Starch Test Solution as an indicator. 1 c.c. of Tenth-normal Volumetric Sodium Thiosulphate indicates 4 p.c. of pure Chromium Trioxide, *U.S.P.*

Preparation.

LIQUOR ACIDI CHROMICI.—Solution of Chromic Acid.

Chromic Anhydride, 1; Distilled Water, 3.

It forms an orange-red caustic liquid, possessing an acid reaction. It is officially required to contain the equivalent of 25 p.c. of Chromic Anhydride, $\mathbf{CrO_3}$; or 29·5 p.c. of Chromic Acid, $\mathbf{H_2CrO_4}$.

Foreign Pharmacopœias.—Official in Belg. and Fr., Chromic Acid, 1 Distilled Water, 1; dissolve.

Tests.—The specific gravity is officially stated to be 1·185; but a solution prepared by dissolving 10 grammes of Chromic Anhydride (free from Sulphuric Acid) in 30 c.c. of Distilled Water had a sp. gr. of 1·214. As the official Chromic Acid is used in its preparation, it is naturally required to answer the tests of identity and purity given in the monograph on this Acid.

Not Official.

GARGARISMA ACIDI CHROMICI.—Chromic Acid, 1 grain; Water, to 1 oz.—*Lock.*

This has been incorporated in the *B.P.C.* as follows:—Chromic Acid, 1; Distilled Water, *q.s.* to produce 500.

LOTIO ACIDI CHROMICI.—Chromic Acid, 10 grains; Water, 1 oz.—*University* and *Westminster.*

PIGMENTUM ACIDI CHROMICI.—Chromic Acid, 10 grains; Water, to 1 oz. In chronic superficial glossitis and secondary syphilis.—*Throat.*

ACIDUM CHRYSOPHANICUM.

See CHRYSAROBINUM.

Not Official.

ACIDUM CINNAMICUM.

$C_9H_8O_2$, eq. 146·95.

There are two varieties of Cinnamic Acid: (1) Medicinal; (2) Artificial.

Medicinal Cinnamic Acid is obtained from natural Cinnamic Acid derivates, *e.g.*, Styrax, etc. Colourless, glistening crystals, having a faint, fragrant odour. Sparingly soluble in Water, soluble in Alcohol (90 p.c.), and in Ether. It is converted into Benzaldehyde on oxidation with Potassium Permanganate. Used in the form of intravenous or intermuscular injection in pulmonary tuberculosis. In 5 p.c. alcoholic solution as an application in laryngeal tuberculosis.

Artificial Cinnamic Acid is prepared synthetically by the interaction of Benzaldehyde and Acetylchloride. Colourless crystals, sometimes possessing a faint odour of Benzaldehyde. Sparingly soluble in Water, readily soluble in Ether and Alcohol. Its use is limited to the preservation of solutions, dressings, etc.

See also **Sodii Cinnamas, p. 1112.**

ACIDUM CITRICUM.

CITRIC ACID.

$H_3C_6H_5O_7, H_2O$, eq. 208·50.

Fr., Acide Citrique; Ger., Citronensaure; Ital. and Span., Acido Citrico.

Large colourless crystals, or a white crystalline powder, possessing an acid taste. Obtained principally from Lemon Juice, which may contain from 5 to 8 p.c.

Solubility.—10 in 6 of Water, and measures 12½; 1 in 2 of Glycerin; 10 in 15 of Alcohol (90 p.c.); 1 in 8 of Ether; almost insoluble in Benzol and Chloroform.

The solubility of Citric Acid in Ether naturally varies with the amount of Alcohol and Water which the Ether contains. The above figure represents its solubility in Ether (sp. gr. 0·735). The figure for Ether Purus (sp. gr. 0·720) is 1 in 40.

Medicinal Properties.—Refrigerant and sialagogue; relieves thirst in fevers. Efficacious in scurvy, for which it is also prophylactic.

Citric Acid 1, dissolved in Distilled Water 12½ (or 35 grains in 1 oz.) is a substitute for Lemon Juice, but does not keep long without spoiling.

17 grains of Citric Acid neutralise about

24¼	grains	Potassium Bicarbonate.
20	,,	Potassium Carbonate.
20½	,,	Sodium Bicarbonate.
34¾	,,	Sodium Carbonate.
12¾	,,	Ammonium Carbonate.
11¾	,,	Magnesium Carbonate.

Dose.—5 to 20 grains = 0·32 to 1·3 grammes.

Prescribing Notes.—*Usually given in powders to be taken with each dose of an alkaline mixture during effervescence; or in solution, directing the quantity to be taken with the alkaline mixture.*

Incompatibles.—Potassium Tartrate, alkaline Carbonates, Acetates, and Sulphides.

Official Preparations.—Used in the preparation of Liquor Ammonii Citratis, Liquor Bismuthi et Ammonii Citratis, Caffeinæ Citras, Ferri et Ammonii Citras, Ferri et Quininæ Citras, Lithii Citras, Potassii Citras, Sodii Citro-Tartras Effervescens, and in all the granular effervescing Citrates.

Not Official.—Syrupus Acidi Citrici.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—Citric Acid is distinguished by the following tests: (1) the production of a white precipitate insoluble in solution of Potassium Hydroxide, but soluble in Ammonium Chloride Solution and in solution of alkali Citrates, when its neutralised solution is boiled with Calcium Chloride Solution; (2) the white precipitate soluble in Ammonia Solution, produced when the neutralised solution is treated with Silver Nitrate Solution. In contradistinction to Tartrates no mirror is produced when this ammoniacal solution is warmed. The melting point of Citric Acid is rather a variable figure (*P.J.* [3], xxi. 1051). The fully Hydrated Acid melts at about 70° C. (158° F.), and the anhydrous acid at 153° C. (307·4° F.), but the crystals, and more particularly the powder, begin to dehydrate even below 70° C. (158° F.), so that intermediate figures will be obtained according to the manner in which it is heated. No melting point is given in the *B.P.*; the *U.S.P.* gives between 152° and 153° C. (305·6° and 307·4° F.), and states that at about 75° C. (107° F.) it begins to lose Water of crystallisation and becomes anhydrous at about 135° C. (275° F.).

It is officially required to indicate 99·38 p.c. of Hydrogen Citrate, as ascertained by titration with Volumetric Solution of Sodium Hydroxide; Phenolphthalein Solution should be employed as an indicator of neutrality, Litmus Solution not being suitable; the *U.S.P.* requires it to contain not less than 99·5 p.c. of pure Citric Acid; the *P.G.* does not state a requisite percentage.

The more generally occurring impurities are Lead, Tartaric Acid, and mineral matter. Calcium, Iron, heavy metals, Oxalic and Sulphuric Acids may also be present. The most important and most likely impurity is Lead, and the official method of testing for this metal has given rise to severe criticism. The *B.P.* directs the solution to be nearly neutralised before the addition of Hydrogen Sulphide and omits reference to limiting the quantity of Hydrogen Sulphide Solution to be employed. *P.G.* directs the solution to be nearly neutralised, whilst the *U.S.P.* makes the solution acid by the addition of a few drops of Hydrochloric Acid, and then requires that it shall not respond to the time-limit test for heavy metals. The methods employed by the Pharmacopœias for testing for Tartaric Acid are also different; the *B.P.* adopting the tests with Ferrous Sulphate and Hydrogen Peroxide; and with Ammonium Molybdate and Hydrogen Peroxide, requiring that an aqueous solution of the acid should not afford a purple or violet coloration when supersaturated with Potassium Hydroxide Solution after the previous addition of a little Ferrous Sulphate Solution and a few drops of Hydrogen Peroxide Solution. The Ammonium Molybdate test is performed by mixing 1 gramme of the acid with 5 c.c. of Ammonium Molybdate Solution, and adding a few drops of Hydrogen Peroxide Solution. The test is not entirely satisfactory, as other substances besides Tartaric Acid yield a similar coloration, notably metallic particles, such as Lead; the *U.S.P.* adopts the test with Solution of Potassium Acetate. The mineral residue left on incineration with free access of air should according to the *B.P.* and *U.S.P.* not amount to more than 0·05 p.c. and according to *P.G.* 0·5 gramme should leave no weighable residue.

A standard of 5 parts per million for Lead and 1 part per million for Arsenic has been suggested (*C.D.* '08, i. 795).

Potassium Acetate Solution.—1 gramme of the powdered Acid dissolved in 5 c.c. of Solution of Potassium Acetate (1–3) should remain clear even after the addition of an equal volume of Alcohol (absence of Tartaric or Oxalic Acid) *U.S.P.*

Pure Sulphuric Acid.—1 gramme Citric Acid with 10 c.c. pure Sulphuric Acid should become at most yellow in colour but not brown, when warmed in a test-tube on a water-bath for 1 hour, *P.G.*

Ammonium Oxalate Solution.—A 10 p.c. w/w aqueous solution should not be affected by Ammonium Oxalate Solution, *P.G.*; 5 c.c. of a 1 in 10 aqueous solution nearly neutralised with Ammonia Solution should remain clear on the addition of 1 c.c. of Ammonium Oxalate Test Solution, *U.S.P.*

Barium Chloride or Barium Nitrate.—A 10 p.c. w/w aqueous solution should not be affected by Barium Nitrate Solution, indicating the absence of Sulphates, *P.G.* 10 c.c. of a 1 p.c. w/w aqueous solution after the addition of a few drops of Hydrochloric Acid should not be rendered turbid within 5 minutes on the addition of 1 c.c. of Barium Chloride Test Solution, indicating limit of Sulphuric Acid, *U.S.P.*

Volumetric Determination.—34·75 c.c. of a solution of 5 grammes Citric Acid in Water to measure 100 c.c., should require not less than 24·87 c.c. of Normal Volumetric Potassium Hydroxide Solution using Phenolphthalein Test Solution as indicator; which is equivalent to not less than 99·5 p.c. of pure Citric Acid, *U.S.P.*

Not Official.

SYRUPUS ACIDI CITRICI. *Syn.* Syrupus Citri.

Belg.—Citric Acid, 20; Syrup, 950; Water, 20; Spirit of Lemon, 2; Alcohol (94 p.c.), 8.

Fr.—Citric Acid, 10; Syrup, 970; Alcoolature de Citron, 20.

Hung.—Citric Acid, 2; Sugar, 100; Water, 50.
Mex.—Citric Acid, 10; Simple Syrup, 970; Water, 20.
Port.—Citric Acid, 1; Syrup of Lemons, 98; Water, 1.
Russ.—Citric Acid, 3; Syrup, 150; Elæosacchari Citri, 1.
Swed.—Citric Acid, 1; Syrup, 19.
Swiss.—Citric Acid, 2; Spirit of Lemon, 1·5; Water, 2·5; Simple Syrup, 94.
U.S.—Citric Acid, 10; Water, 10; Tincture of Fresh Lemon Peel, 10; Syrup, to make 1000.
B.P.C.—Citric Acid, 3; Tincture of Lemon, 3; Syrup, *q.s.* to produce 100.

All by weight except U.S. and *B.P.C.*

Not Official.

ACIDUM CRESYLICUM.

CRESYLIC ACID. CRESOL.

C_7H_8O, eq. 107·25.

A colourless or slightly yellow liquid, with a tarry odour, obtained from Coal-tar. It should be preserved in well-stoppered glass bottles of a dark amber colour.

There are three isomeric Cresols, but the principal constituent of the 'crude Carbolic Acid' of commerce (the source of commercial Cresylic Acid) is the Para-cresylic Acid, with more or less of its isomers.—*Allen.*

A mixture of the three was introduced as an antiseptic under the name of **Trikresol.**

By the same process which yields Salicylic Acid from Phenol, the three isomeric Cresols yield three corresponding Cresotic or Cresotinic Acids, the Sodium salts of which have been used in Medicine.

Solubility.—1 in 80 of Water, and mixes in all proportions with Alcohol (90 p.c.), Ether, Chloroform, Glycerin, and Olive Oil.

Medicinal Properties.—Disinfectant and antiseptic. Used as an **inhalation** in whooping-cough, and other respiratory affections.

Prescribing Notes.—*It is far less soluble in Water than Carbolic Acid, and therefore not so convenient.*

Foreign Pharmacopœias.—Official in Fr., Ger., Jap. and Swiss, Cresolum crudum, a yellowish liquid; Austr., Kresolum, acicular crystals which become yellow or brown on keeping, soluble in 38 parts of Water. Austr. has also Kresolum Liquifactum (Kresol, 100, Water, 10), and Aqua Kresolica (about 1 of liquefied Kresol in 50). Belg., Cresolum crudum, yellow or brownish liquid; Dutch, Cresolum crudum, yellow, yellowish-brown, or reddish-brown liquid; Mex., Cresilol, colourless fluid; Span., Cresol, yellowish-red liquid; U.S., Cresol, colourless or straw-coloured liquid.

Tests.—Cresol has a specific gravity of 1·045 to 1·048, and a boiling point when pure of 203° C. (397·4° F.), but a good commercial sample may boil 10° C. lower. The *U.S.P.* specifies a sp. gr. at 25° C. (77° F.) of 1·036 to 1·038 and a boiling point from 195° to 205° C. (383° to 401° F.). Neither sp. gr. nor boiling point are given in *P.G.* It does not crystallise at the freezing point of Water. Its aqueous solution gives a transient blue colour with solution of Ferric Chloride.

The converse of the test for Cresol (Cresylic Acid) in Phenol applies here. Equal volumes of Cresol and Glycerin should form a clear solution from which on the addition of three volumes of Water most of the Cresol should separate.

The more generally occurring impurities are hydrocarbon oils.

These are readily detected by mixing equal volumes of Cresol and Sodium Hydroxide Solution (10 p.c.) which should form an almost clear liquid from which on standing no appreciable oily layer shall separate.

Sodium Hydroxide Solution.—1 c.c. of Cresol should dissolve in 1 c.c. of a 10 p.c. solution of Sodium Hydroxide leaving no appreciable liquid residue, *U.S.P.*; when a volume of 10 c.c. of Cresol is shaken in a 200 c.c. stoppered graduated measure, with 50 c.c. of a 15 p.c. aqueous solution of Sodium Hydroxide and 50 c.c. of Water only a few flocks shall separate out. On the subsequent addition of 30 c.c. of Hydrochloric Acid and 10 grammes of Sodium Chloride and shaking, an oily layer collects on the top of the liquid, when allowed to remain at rest, which shall amount to 8·5 to 9 c.c., *P.G.*

A similar test to the above is official in the P. Belg.

Ferric Chloride Solution.—When 0·5 c.c. of Cresol is shaken with 300 c.c. of Water a liquid is obtained which is coloured bluish-violet by the addition of solution of Ferric Chloride.—*Belg.* and *P.G.*

LIQUOR CRESOLIS COMPOSITUS.—Cresol, 50; Linseed Oil, 35; Potassium Hydroxide, 8; Water, *q.s.* to make 100; all by weight.—*U.S.P.*

Germicidal value stated to be greater than Carbolic Acid.—*L.* '07, ii. 544; '08, i. 576.

Cresylic Acid, by weight, 50; Linseed Oil, by weight, 35; Potassium Hydroxide, 8; Alcohol, 4; Distilled Water, to produce by weight 100.—*B.P.C.*

LIQUOR CRESOLI SAPONATUS (*Ger.*, *Jap.* and *Swed.*).—Crude Cresol, 1; Sapo Kalinus (*see* Sapo), 1; warm and mix to form a yellowish-brown fluid.

A similar mixture is official in Belg. and Swiss, under the title of Cresolum Saponatum.

The liquor Cresoli Saponatus of the Dutch Pharmacopœia is the same as above, but the product is finally made up to 2 with Water, and **Lysol** is given as a synonym.

Aqua Cresolica (*Belg.* and *Ger.*).—Cresol Soap Solution, 1; Distilled Water, 9.

Cresol Soap Solution, 6; Water, 94.—*Jap.*

Liquor Cresolis Glycerinatus.—Cresol, 50; Linseed Oil, 18; Potassium Hydroxide, 4·25; Alcohol, 2; Glycerin, 6; Distilled Water, *q.s.* to produce 100; all by weight.—(*W. J. Uglow Woolcock*) *P.J.* '07, ii. 334.

This has been incorporated in the *B.P.C.* under the title **Solutio Cresolis Saponatus,** with synonym as above.

The following is understood to be the composition of the various proprietary preparations:—

JEYES' FLUID.—A preparation of Tar Oil containing 20 p.c. Tricresol saponified with resin and alkali. It forms a permanent emulsion with Water.

Used in 1 or 2 p.c. solution, and for the same purposes as Carbolised Solutions. An injection of 1 in 400 is excellent in gonorrhœa and ozœna, and in obstetric practice on account of its hæmostatic as well as its antiseptic properties. It is useful as an ointment in erysipelas.

PEARSON'S ANTISEPTIC is a similar preparation to Jeyes' Fluid. The Carbolic Acid coefficient for *B. Typhosus* is 2·6.—*Public Health, Dec.* 1903.

ARTMANN'S CREOLIN.—A solution of Tar hydrocarbons in Sulphocresylic Acid. It forms a turbid liquid with Water.

EUROPHEN (Di-isobutyl-orthocresol Iodide).—A fine light, brownish-yellow, amorphous powder, having an aromatic saffron-like odour. Introduced as a substitute for Iodoform. Insoluble in Water or Glycerin; freely soluble in Absolute Alcohol, Chloroform or Ether. Applied as a dusting **Powder**, or 10 p.c. **Ointment.**

Losophan (Tri-iodometacresol), a white or yellowish-white powder, insoluble in Water, soluble 1 in 7 of Alcohol (90 p.c.); 1 in 4 of Ether; 1 in 6 of

Chloroform; and **Traumatol** (Iodocresol), are compounds of Cresol and Iodine, introduced into medicine chiefly as substitutes for Iodoform.

LYSOL.—Sp. gr. 1·047. A transparent brown syrupy liquid, which forms a clear solution with Water. It is a solution in neutral Soap, of Tar Oils which distil between 187° and 200° C., and are present to the extent of about 47 p.c.

Foreign Pharmacopœias.—Official in Dutch, Mex. and Russ.

Injection of 9 to 12 c.c. of a 1 p.c. solution of Lysol into the spinal canal in cerebro-spinal meningitis.—*L.* '02, ii. 1188.

SAPROL.—Tar Oils dissolved in large excess of Hydrocarbons. Inflammable.

SOLUTOL.—Sodium Cresylate in excess of Cresol, powerfully disinfectant, but caustic, and not intended for surgical purposes.

SOLVEOL.—Cresols in Sodium Cresotate, soluble in Water. Non-caustic, and used for surgical purposes.

METAKALIN.—A readily soluble solid preparation of Cresol. Supplied in two forms (*a*) In cartridges of 2½ drm. each; (*b*) In the form of tablets of 15 grains each, each tube containing ten tablets.

CRESOTINIC ACID.—There are three varieties of Cresotinic Acid, the ortho- meta-, and para-cresotinic acid. The only one of these which has received attention as a medicinal agent is the para-cresotinic acid.

PARA-CRESOTINIC ACID occurs in long white needles or in rhombic prisms. Antiseptic, antirheumatic and antipyretic.

SODIUM PARACRESOTINATE.—The Sodium salt of Para-cresotinic acid. A white crystalline powder. Employed in doses and for purposes similar to Sodium Salicylate.

A **Calcium Cresotinate** is also known as a disinfectant.

Not Official.

ACIDUM FORMICUM.

FORMIC ACID, AMINIC ACID.

H_2CO_2, eq. 45·67.

A clear, colourless, volatile liquid, possessing an irritating odour and strongly acid taste. It is miscible in all proportions with Water.

It is a powerful stimulant of muscular action, retards fatigue, and gives a markedly increased capacity for work. In its tonic effects it is closely allied to Kola, Coca and Caffeine. It has also a diuretic effect, but not to the same extent as Theobromine. In small doses it markedly improves the appetite and general nutrition.

Dose.—2 to 5 minims = 0·12 to 0·3 c.c. in aerated Water.

The acid has been given (*B.M.J.E.* '03, ii. 56) in doses of from 8 to 10 drops, taken four times daily in a little Vichy or aerated Water.

It has been used in the treatment of lupus, and in cancer in the form of a subcutaneous injection in doses of 0·1 to 1·0 c.c. of a solution 1 to 100,000 to 1 in 1000, according to the age and condition of the patient.

Three hundred cases of diphtheria treated with 5 to 20 minims of 25 p.c. solution of Formic Acid 4-hourly for 10 to 14 days, plus antitoxin; the death-rate from cardiac failure reduced from 8·6 to 2 p.c.—*Edin. Med. Jour.* '06, ii. 337.

No drug so good in chorea, as it steadies the muscular system without weakening it.—*L.* '07, ii. 1686.

Formates are stated (*L.* '05, i. 892; '07, i. 1176) to increase the power of resistance to fatigue and to promote energy. They are also slightly diuretic. 3 grammes (45 grains) of the Potassium or Sodium salt may be given daily, or a gramme and a half (23 grains) of the Lithium salt. The treatment is generally continued for ten days, followed by an interval of ten days' rest.

The acid has been given (*B.M.J.E.* '05, ii. 39) in rheumatic conditions in the orm of a 2½ to 3 p.c. solution, eight drops as an injection after injecting five to eight drops of a 1 p.c. solution of Cocaine as a local anæsthetic; and has been administered (*L.* '05, ii. 907) in doses of 4 grammes of the normal solution in the treatment of tremor. The remedy may also prove useful in certain forms of chorea.

Foreign Pharmacopœias.—Official in Ger. and Swiss.

Tests.—Formic Acid has a specific gravity of 1·060 to 1·063. A white crystalline precipitate is produced when it is mixed with Lead Acetate. When either the acid itself or its neutralised solution is warmed with Silver Nitrate Solution a precipitate of metallic Silver is thrown down, when warmed with Mercuric Oxide metallic Mercury is precipitated, with Mercuric Chloride a white precipitate of Calomel is produced. On the addition of Ferric Chloride Test-solution a reddish-brown solution is produced, which on heating throws down a reddish-brown precipitate; when warmed with concentrated Sulphuric Acid, Carbon Monoxide gas is evolved which burns with a blue flame. The percentage of acid may be determined by titration with Normal Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality; 5 c.c. of Formic Acid should require 28 to 29 c.c. of the Volumetric Solution, indicating 24 to 25 p.c. w/w of absolute acid. When diluted with Water and acidified with Nitric Acid, it should yield no immediate precipitate or turbidity with Silver Nitrate Solution, indicating the absence of Chlorides; when neutralised with Ammonia Solution it should neither yield a precipitate nor a turbidity on the addition of Calcium Chloride Solution, nor a coloration on the addition of Hydrogen Sulphide Solution, indicating the absence of Oxalic Acid and of Lead and Copper. When heated it should be entirely volatilised without leaving a weighable residue.

ACIDUM GALLICUM.

GALLIC ACID.

TRIHYDROXYBENZOIC ACID.

$H_3C_7H_3O_5, H_2O$, eq. 186·65.

FR., ACIDE GALLIQUE; GER., GALLUSSAURE; ITAL., ACIDO GALLICO; SPAN., ACIDO AGALLICO.

White or light brownish-yellow crystalline needles or prisms; odourless, and possessing an astringent and faintly acidulous taste.

It is produced by the hydrolysis of Tannic Acid, Sulphuric Acid being the acid generally employed for this purpose. It is also present in small proportion in Galls. It should be preserved in dark amber-tinted glass bottles.

Solubility.—1 in 100 of cold Water; 1 in 3 of boiling Water; 1 in 8 of Alcohol (90 p.c.); 1 in 50 of Ether; 1 in 6 of Glycerin with heat. Gallic Acid 1, and Potassium Citrate 1, will dissolve in 30 of Water.

Medicinal Properties.—It was at one time used as a local astringent, but it is far inferior to Tannic Acid for this purpose. As Tannic Acid is converted into Gallic Acid in passing through the circulation, the latter has been given for the purpose of arresting hæmorrhage in remote vessels, but is now generally believed to be useless in such cases.

Useless for pulmonary or renal hæmorrhage.—*B.M.J.* '00, ii. 1070.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Prescribing Notes.—*With twice its weight of Sugar, may be taken three times a day in Water, in* **powders** *or in* **cachets.** *It is also given in* **pills***: 30 grains of Acid and 3 minims of Glycerin will make 6 pills.*

Incompatibles.—Spiritus Ætheris Nitrosi, metallic salts.

Not Official.—Gallanol, Galloformin, Gallobromol.

Foreign Pharmacopœias.—Official in Belg., Fr., Ital., Jap., Mex., Port., Span., Swiss and U.S. Not in the others.

Tests.—Gallic Acid dissolves in Water, forming a solution which is acid in reaction towards blue Litmus paper, and which yields a bluish-black precipitate on the addition of a few drops of Ferric Chloride Test-solution. Solutions of pure Ferrous salts are unaffected by the addition of solution of Gallic Acid, but with Ferric salts precipitation takes place as above. The *U.S.P.* states that at about 200° C. (392° F.) it begins to melt.

The more generally occurring impurities are excess of Water, Tannic Acid, Sulphates and mineral matter. The crystalline acid should lose 9·5 p.c. of its weight at a temperature of 100° C. (212° F.), indicating one molecule of Water of crystallisation. This statement is common to the *B.P.* and *U.S.P.* The absence of Tannic Acid is shown by the aqueous solution of the acid failing to give a precipitate with solutions of Isinglass or Albumen. The *B.P.* adds or Tartarated Antimony. The *U.S.P.* substitutes Solution of Gelatin for Solution of Isinglass, omits the Solution of Tartarated Antimony, but includes Test-solution of Starch. It also includes tests with Calcium Hydroxide Solution and with Sodium Hydroxide Solution, which are described below. It has been pointed out (*P.J.* '98, ii. 684 ; '99, i. 58) that what is ordinarily understood as 'Gallic Acid' gives a precipitate with Tartarated Antimony Solution, contrary to the official statement.

The absence of Sulphates is ensured by the usual tests, and the absence of mineral matter by the absence of ash when the acid is ignited at a low red heat.

Residue.—When incinerated with free access of air, Gallic Acid should leave no residue, *B.P.*; *U.S.P.* states that at about 200° C. it begins to melt, and at a high temperature it is gradually decomposed, being consumed at a low red heat without leaving a residue.

Sodium Hydroxide Solution.—If 6 drops of Sodium Hydroxide Test Solution be added to 5 c.c. of a saturated aqueous solution of Gallic Acid on a watch glass, the liquid will gradually acquire a deep green colour, which is changed to red or brownish-red by acids. Difference from and absence of Tannic Acid, *U.S.P.*

Calcium Hydroxide Solution.—When Calcium Hydroxide Test Solution is added to a cold saturated solution of Gallic Acid, a bluish-white precipitate forms where the test solution is temporarily in excess and disappears on shaking. When the test solution has been added in excess the precipitate no longer dissolves, and the liquid acquires a tint that is blue by reflected and green by transmitted light and becomes pink on the addition of a large excess of Calcium Hydrate Test Solution. Distinction from Tannic Acid, *U.S.P.*

Not Official.

GALLANOL (Gallic Acid Anilide).—Colourless crystals, melting at 205° C. Insoluble in Water. Introduced as a substitute for Chrysophanic Acid in psoriasis.—*B.M.J.E.* '93, ii. 99 ; '94, i. 12 ; ii. 44. In eczema.—*M.A.* '95, 226.

GALLOFORMIN.—A compound of Gallic Acid with Hexamethylenetetramine. Glistening needles, almost insoluble in cold Water. Used externally and internally as a disinfectant.

GALLOBROMOL (*Dibromogallic Acid*).—Colourless needles or prisms, or as a white crystalline powder. Soluble 1 in about 8 of Water, readily soluble in Alcohol and Ether. Used internally as a substitute for the alkali Bromides in daily doses of 2 to 3 grammes (30 to 45 grains). Also in the form of a 1 to 2 p.c. solution as an injection in gonorrhœa.

Dose.—8 to 16 grains = 0·52 to 1 gramme, three times a day.

Under the name of **Gallogen**, Ellagic Acid, the astringent principle of Divi-divi, has been introduced as an astringent.

Not Official.

ACIDUM GLYCEROPHOSPHORICUM.

See CALCII GLYCEROPHOSPHAS.

Not Official.

ACIDUM HYDRIODICUM.

This Acid is best prepared and kept in the form of a 20 p.c. solution (sp. gr. 1·17) by passing Hydrogen Sulphide gas through four parts of Water containing one part of Iodine. The action is rather slow at first, but becomes more rapid as more Iodine is dissolved by the Hydriodic Acid formed, till the absorption becomes very rapid. When the solution is colourless, the excess of Hydrogen Sulphide may be boiled off and the liquid filtered from separated Sulphur.

Though colourless when first made, it rapidly decomposes, even in diffused light, with liberation of Iodine, but may be readily decolorised by warming with a small proportion of Hypophosphorous Acid; 60 minims to 4 oz. is usually sufficient even for a highly coloured Acid.

Acidum Hydriodicum Dilutum (U.S.).—A solution containing not less than 10 p.c. w/w of absolute Hydriodic Acid.

SYRUPUS ACIDI HYDRIODICI.—Colourless Hydriodic Acid (20 p.c.), 3½ oz.; Distilled Water, 8 oz.; Simple Syrup, sufficient to make up the measure to 80 oz.

An acid syrupy liquid, colourless, or of a pale straw tint. Sp. gr. 1·300. Contains 1 p.c. of absolute Hydriodic Acid, HI. The *U.S.P.* preparation contains the same percentage of absolute Hydriodic Acid, but is of a much lower specific gravity (1·190 at 25° C. (77° F.)). A test is included for a limit of free Iodine, also a confirmatory test for Hydriodic Acid by means of Test-solution of Silver Nitrate, and the amount of absolute Hydriodic Acid is determined by the addition of a definite volume of Tenth-normal Volumetric Solution of Silver Nitrate, a little diluted Nitric Acid, followed by the addition of Test-solution of Ferric Ammonium Sulphate. The excess of Volumetric Silver Solution is determined by titration with Tenth-normal Volumetric Solution of Potassium Sulphocyanate.

Dose.—20 to 40 minims = 1·2 to 2·4 c.c., well diluted.

Foreign Pharmacopœias.—Official in U.S. Not in the others.

Diluted Hydriodic Acid (10 p.c.), 10; Water, 30; Syrup, 60; all by weight to make 100.—*U.S.P.*

Diluted Hydriodic Acid (10 p.c.), 10; Water, 30; Syrup, to produce 100; all by weight.—*B.P.C.*

ACIDUM HYDROBROMICUM DILUTUM.

DILUTED HYDROBROMIC ACID.

FR., ACIDE BROMHYDRIQUE DISSOUS; GER., BROMWASSERSTOFFSAURE; ITAL., ACIDO BROMIDRICO; SPAN., ACIDO BROMHIDRICO OFICINAL.

A clear, colourless liquid, containing 10 p.c. by weight of Hydrogen Bromide, **HBr**, eq. 80·35.

It may be obtained by the decomposition of Potassium Bromide by concentrated Phosphoric Acid and distillation. Considerable trouble has been experienced (*P.J.* '00, i. 315; *Y.B.P.* '00, 19) in obtaining pure Hydrobromic Acid by the use of red Phosphorus, owing to the Arsenic present in the latter. The method suggested in the reference consists of blowing Sulphur Dioxide into a mixture prepared by covering a quantity of pure Bromine with six times its volume of Water. On distilling the liquid the remaining Bromine goes over first, and is easily got rid of.

It should be preserved in stoppered glass bottles of a dark amber tint, and as far as possible protected from the light.

Medicinal Properties.—Sedative and hypnotic, but not so reliable as the Bromides, though producing less depression. When continued sedative action is indicated, the acid can be used to supplement or replace the Bromide salts. It is stated to be less likely to produce acne.

Dr. Fothergill stated that it prevents headache after taking Quinine and Iron, and may be given with Quinine (which it readily dissolves) for nervous exhaustion.

It is said to prevent the after-effects of Morphine if given with that drug.

Dose.—15 to 60 minims = 0·9 to 3·6 c.c.

Prescribing Notes.—*Larger doses may be given*, 2 *to* 4 *fl. drm., well diluted with Water, or Syrup and Water.*

60 *minims* = 8⅔ *grains of Potassium Bromide in the quantity of Bromine.*

Foreign Pharmacopœias.—Official in Dutch, sp. gr. 1·224; Fr., Span., Swiss and U.S., 10 p.c., sp. gr. 1·076 to 1·077; Ger. has 25 p.c., sp. gr. 1·208. Not in the others.

Tests.—Diluted Hydrobromic Acid has a specific gravity of 1·077; the *U.S.P.* states 1·076 at 25° C. (77° F.); *P.G.* 1·208. A solution of the neutralised acid should give with Silver Nitrate Solution a yellowish curdy precipitate, insoluble in Nitric Acid, but soluble in Potassium Cyanide Solution, and soluble with difficulty in strong Ammonia Solution; Chlorine Solution causes a yellowish or reddish coloration due to the liberation of Bromine, which dissolves on shaking with a few drops of Chloroform or Carbon Bisulphide forming a reddish solution. It is officially required to indicate 9·98 p.c. of absolute Hydrobromic Acid as determined by titration with Volumetric Sodium Hydroxide Solution, or by precipitation with Volumetric Silver Nitrate Solution. The *P.G.* Volumetric test indicates an acid containing 25 p.c. by weight, and the *U.S.P.* test not less than 9·99 p.c. by weight of absolute Hydrobromic Acid. A comparison of the methods adopted by the *B.P.*, *U.S.P.* and *P.G.* appears below under the heading of Volumetric Determination.

The more generally occurring impurities are solid residue, Arsenic, Copper, Lead and Iron; Barium, Chlorides, Phosphates, Sulphates and Sulphites, impurities which are present in the materials used in the manufacture and escape removal during the purification of the acid. Mineral residue is readily detected by evaporation to dryness. Arsenic is the most important impurity, as Phosphorus and Phosphoric Acid are both liable to contain this substance. The *U.S.P.* introduces a special test (the modified Gutzeit's test) for Arsenic, and also requires that this should not respond to the time-limit test for heavy metals. The *B.P.* does not include a test for the latter. The *P.G.* includes a test for Iron with Potassium Ferrocyanide Solution, which is given in the small type below.

Copper and Lead, if present, may be detected by the test with Hydrogen Sulphide given in the small type below, and if the solution be made alkaline with Ammonia the test also affords an indication of the presence of Iron. Iodine, if present, may be detected by the test described under the heading of Chloroform. Barium, Chlorides, Phosphates, Sulphates and Sulphites may be detected by the tests in small type below under the respective headings of Potassium Sulphate Solution, Silver Nitrate Solution followed by Ammonium Carbonate Solution, Magnesium Sulphate Solution, Barium Nitrate or Chloride Solution.

Distillation.—The *U.S.P.* states that on distilling it, Water and a weak acid first pass over; when the temperature of 126° C. (258·8° F.) is reached an acid of 48 p.c. remains, which may be distilled unchanged.

Residue.—*B.P.* requires that it should yield no residue on evaporation to dryness. In this test the *U.S.P.* directs that after evaporation to dryness the temperature be brought to 110° C. (230° F.), when 10 c.c. of the acid should leave no appreciable residue.

Chloroform.—Hydrobromic Acid when shaken with Chloroform should not impart to the Chloroform a yellow colour, nor on the subsequent addition of a drop of Ferric Chloride Solution should a violet colour be produced, *P.G.* The *U.S.P.* gives 10 c.c. of the Acid and 2 c.c. of Chloroform, and the *P.G.* uses equal volumes. Chloroform shaken with Hydrobromic Acid previously mixed with Chlorine Water is coloured a brownish-yellow, *P.G.* The *U.S.P.* directs that Chlorine Water be diluted with an equal volume of Water and added drop by drop with agitation to 10 c.c. of Hydrobromic Acid and 2 c.c. of Chloroform, previously shaken together, when the Chloroform should be coloured orange, with no trace of violet, indicating the absence of Iodine.

Hydrogen Sulphide Solution.—Diluted with 5 volumes of Water, and nearly neutralised with Solution of Ammonia, Hydrobromic Acid should be unaffected by Hydrogen Sulphide Solution, *P.G.* The *U.S.P.* requires that 10 c.c. of Diluted Hydrobromic Acid should not, without further acidulation, respond to the time-limit test for heavy metals.

Barium Nitrate or Chloride Solution.—10 c.c. of the Acid should not be rendered more than slightly cloudy by the addition of 1 c.c. of Barium Chloride T.S., indicating a limit of Sulphuric Acid, *U.S.P.*; *P.G.* nearly neutralises with Ammonia Solution, and uses Barium Nitrate Solution.

Potassium Sulphate Solution.—10 c.c. of the Acid should yield no turbidity with 1 c.c. T.S. of Potassium Sulphate, *U.S.P.*

Magnesium Sulphate Solution.—1 c.c. of Acid with 1 c.c. of Nitric Acid, boiled, cooled, and then supersaturated with Solution of Ammonia should be unaffected by Magnesium Sulphate Solution even after standing for some time, *P.G.*

Modified Gutzeit's Test.—5 c.c. should not respond to the modified Gutzeit's test for Arsenic.

Silver Nitrate Solution followed by Ammonium Carbonate Solution.—If a mixture of 0·5 c.c. Diluted Hydrobromic Acid, 10 c.c. of Water, 8 c.c. Silver Nitrate Test Solution, and 6 c.c. Ammonium Carbonate Test Solution, be digested for 10 minutes on a bath of boiling Water, then cooled and filtered, the filtrate when supersaturated with Nitric Acid should not become more than slightly opalescent, *U.S.P.*

Potassium Ferrocyanide Solution.—The *P.G.* requires that 10 c.c. of Hydrobromic Acid diluted with Water (1–10) should not immediately turn blue with 0·5 c.c. Potassium Ferrocyanide Solution.

Volumetric Determination.—The *B.P.*, *U.S.P.* and *P.G.* differ in their method of determining the amount of absolute Hydrobromic Acid. The *B.P.* employs both titration with Volumetric Sodium Hydroxide Solution and precipitation with Volumetric Silver Nitrate Solution; the *U.S.P.* employs direct titration with Tenth-normal Volumetric Silver Nitrate; the *P.G.* titration with Normal Volumetric Potassium Hydroxide Solution. It is officially required that 4 grammes of diluted Hydrobromic Acid should neutralise 5 c.c. (4·98) of the Volumetric Sodium Hydroxide Solution, *B.P.*; 5 c.c. of the *P.G.* Acid should require 18·7 c.c. Normal Potassium Hydroxide Solution, *P.G.* The *B.P.* requires that 4 grammes of the dilute Acid should be completely precipitated by 50 c.c. (49·8) of the Volumetric Solution of Silver Nitrate. The *P.G.* directs that 10 c.c. of a mixture of Hydrobromic Acid and Water (3 grammes in 100 c.c.) be exactly neutralised with Ammonia Solution and a drop of Potassium Chromate Solution added, when 9·3 c.c. at most of Deci-normal Volumetric Silver Nitrate Solution are necessary to produce a permanent red colour, *P.G.*; the *U.S.P.* test is similar, 10 grammes of Acid being diluted to 100 c.c., then 8·04 c.c. of this solution exactly neutralised with diluted Ammonia Water (using Litmus Test-solution as indicator), and 3 drops of Potassium Chromate Test-solution added, should require not less than 10 c.c. of Tenth-normal Silver Nitrate Volumetric Solution to impart a permanent red tint.

ACIDUM HYDROCHLORICUM.

HYDROCHLORIC ACID.

FR., ACIDE CHLORHYDRIQUE OFFICINAL; GER., SALZSAURE; ITAL., ACIDO CLORHIDRICO CONCENTRATO; SPAN., ACIDO CLORHIDRICO.

A colourless fuming liquid, containing 31·79 p.c. by weight of Hydrogen Chloride (**HCl**, eq. 36·19), possessing an irritating pungent odour, and even in dilute solutions an intensely acid taste.

It may be obtained by the decomposition of a Chloride, generally Sodium Chloride with Sulphuric Acid.

Acidum Hydrochloricum *B.P.* 1885 contained 32 p.c. of Hydrogen Chloride.

Medicinal Properties.—A powerful escharotic. When diluted it is given internally, *see* Acidum Hydrochloricum Dilutum.

Treatment of ulceration of the œsophagus and stomach due to swallowing strong Hydrochloric Acid.—*B.M.J.* '01, ii. 1468; '02, i. 511.

Treatment of lupus by thoroughly rubbing crude Hydrochloric Acid over the patch previously frozen by Æthyl Chloride.—*L.* '07, ii. 81.

Incompatibles.—Salts of Silver and Lead, Tartar Emetic, Alkalis and their Carbonates.

Official Preparations.—Acidum Hydrochloricum Dilutum. Used in the preparation of Acidum Nitro-hydrochloricum Dilutum, Apomorphinæ Hydrochloridum, Cocainæ Hydrochloridum, Extractum Cinchonæ Liquidum, Glycerinum Pepsinæ, Liquor Arsenici Hydrochloricus, Liquor Ferri Perchloridi Fortis, Liquor Zinci Chloridi, and Podophylli Resina.

Antidotes.—In cases of poisoning by Hydrochloric Acid, the antidotes are Chalk, Magnesia, Potassium Bicarbonate, with White of Egg, Carron Oil, or Soap-suds; followed by enemata of Beef Tea and Brandy (with Tincture of Opium) to prevent collapse; and emollient drinks.

Foreign Pharmacopœias.—Official in Austr., 25 p.c., sp. gr. 1·124; Belg., sp. gr., 1·186; Port. and Span., sp. gr. 1·180; Dutch and Swiss, 25 p.c., sp. gr.

1·126; Fr., 33·65 p.c., sp. gr. 1·171; Jap., 30 p.c., sp. gr. 1·15; Mex., 1·17; Dan., Norw. and Swed., 25 p.c., sp. gr. 1·127; Ger., Hung. and Russ., 25 p.c., sp. gr. 1·124; Ital., 35·39 p.c., sp. gr. 1·18; U.S., 31·9 p.c., sp. gr. 1·158 at 25° C. (77° F.). An **Acidum Hydrochloricum Crudum** is included in the Fr., Ital., Russ. and Swed.

The Crude Acid made with Pyrites Vitriol is generally yellow, and contains considerable traces of Iron and Arsenic.

Tests.—Hydrochloric Acid has a specific gravity of 1·160; the *U.S.P.* gives about 1·158 at 25° C. (77° F.); the *P.G.* 1·124. The diluted or neutralised solutions afford, when treated with Silver Nitrate Solution, a curdy white precipitate, insoluble in dilute Nitric Acid, but readily soluble in Ammonia Solution. Another characteristic test for Hydrochloric Acid, which in the *P.G.* and *U.S.P.* is performed upon the pure undiluted or unneutralised acid, but in the *B.P.* appears amongst the miscellaneous collection of tests suitable for application to the neutralised acid, is that when warmed with Manganese Oxide, Chlorine gas is evolved, which may be recognised by its colour, odour, and bleaching action upon moistened Litmus paper, and by liberating Iodine when brought into contact with Potassium Iodide Solution. The acid is officially required to contain 31·49 p.c. of absolute Hydrochloric Acid as indicated by titration with Volumetric Solution of Sodium Hydroxide; the *U.S.P.* test indicates 31·9 p.c. by weight of absolute Acid, and the *P.G.* 25 p.c. by weight. The processes are compared below under the heading of Volumetric Determination.

The more generally occurring impurities are mineral residue, Arsenic, Lead, Copper, Iron, Aluminium, free Chlorine, Bromine, Iodine, Sulphates and Sulphurous Acid. The most important of these are Arsenic, Iron, and free Chlorine. Mineral matter is readily detected by the residue left on evaporation. The *B.P.* characteristically groups Arsenic amongst the general list of impurities, and employs the tests mentioned in the Appendix for its detection. The *U.S.P.* adopts the modified Gutzeit's test, and the *P.G.* the test with Stannous Chloride Solution. The *P.G.* includes a specific test for Iron with Potassium Ferrocyanide Solution, *see* below. The three Pharmacopœias differ in their manner of testing for free Chlorine. All three use the diluted acid, the *P.G.* in addition partially neutralising the liquid; the *B.P.* employs Potassium Iodide and Starch Solution as a reagent; the *P.G.* Zinc Iodide and Starch Solution; the *U.S.P.* uses Potassium Iodide Solution, but shakes with Chloroform, and notes the absence of a violet coloration in the chloroformic layer in preference to the Starch test. A 1 to 20 dilution of the Acid almost neutralised with Ammonia Solution should not be altered by the addition of Hydrogen Sulphide Solution, indicating the absence of Lead and Copper. The *U.S.P.* requires that the 1 in 20 aqueous dilution should not respond to the time-limit test for heavy metals; the *P.G.*, that the 1 to 5 dilution, when almost neutralised with Ammonia Solution, shall not be altered by Hydrogen Sulphide Solution. Bromine and Iodine, Sulphates and Sulphites may be detected by the respective tests under the headings of Chlorine Water, and Barium Chloride or Nitrate Solution.

A standard of 5 parts per million for Arsenic is suggested (*C.D.* '08, i. 795) as sufficient for a pharmaceutical acid, and 10 parts per million for Lead.

Stannous Chloride.—A mixture of 1 c.c. of Acid and 3 c.c. Stannous Chloride Solution should not assume a dark colour in the course of an hour, *P.G.*

Modified Gutzeit's Test.—5 c.c. of diluted Acid (1·10) should not respond to the modified Gutzeit's test for Arsenic.

Potassium or Zinc Iodide Solution.—When largely diluted with Water it should yield no blue coloration on the addition of Potassium Iodide Solution and Starch Mucilage, *B.P.*; the *P.G.* directs the Acid to be diluted with 5 volumes of Water, and nearly neutralised with Solution of Ammonia; and requires that this solution should not immediately turn blue with a Solution of Zinc Iodide and Starch. The *U.S.P.* dilutes 1 c.c. of Acid with 5 c.c. of Water, then on the addition of 1 c.c. of Potassium Iodide T.S. and 1 c.c. of Chloroform, and the mixture agitated, the Chloroform should be free from any violet coloration.

Chlorine Water.—If Chlorine Water diluted with an equal quantity of Water be added cautiously, drop by drop with constant agitation, to Hydrochloric Acid diluted with an equal volume of Water, and 1 c.c. of Chloroform added, the Chloroform should be free from any yellow, orange, or violet colour, *U.S.P.*

Barium Chloride or Nitrate Solution.—Hydrochloric Acid diluted 1 to 5 with Water and nearly neutralised with Ammonia Solution should be unaffected within 5 minutes by Barium Nitrate Solution, *P.G.* The *U.S.P.* uses Barium Chloride T.S., a few drops added to 1 c.c. of the Acid previously diluted with 5 c.c. of Water, when no turbidity or precipitate should be produced within 1 hour, nor should the addition of a few drops of Tenth-normal Iodine V.S. to the mixture produce any turbidity.

Potassium Ferrocyanide Solution.—10 c.c. Hydrochloric Acid diluted with Water (1–10) should not immediately turn blue on the addition of 0·5 c.c. Potassium Ferrocyanide Solution, *P.G.*

Volumetric Determination (by neutralisation).—The *B.P.* requires that 1 gramme diluted with Water should neutralise 8·7 c.c. of the Sodium Hydroxide Volumetric Solution; precipitation with Volumetric Silver Nitrate Solution is also adopted as a means of determining the amount of absolute Acid present, 8·7 c.c. of Volumetric Silver Nitrate Solution being required to precipitate 0·1 of a gramme of the acid. The *P.G.* uses Normal Potassium Hydroxide Solution, 38·5 c.c. of this solution being necessary for 5 c.c. of Acid. The *U.S.P.* directs that 3 c.c. of Acid be accurately weighed, diluted with 5 c.c. of Water and titrated with Normal Potassium Hydroxide Solution, using Methyl Orange Test-solution as indicator. The number of c.c. required, multiplied by 3·618 and divided by the weight of Acid taken, represents the percentage of absolute Hydrochloric Acid in the sample taken.

Preparation.

ACIDUM HYDROCHLORICUM DILUTUM.—DILUTED HYDROCHLORIC ACID.

Dilute 6 of Hydrochloric Acid with Distilled Water to make 20.

$3\frac{1}{3}$ minims contain about 1 minim of Strong Acid.

It is a clear, colourless and odourless liquid, possessing a strong acid taste and acid reaction to Litmus.

Medicinal Properties.—Stimulant, sialagogue, stomachic tonic, cholagogue. Externally and diluted it is refrigerant. Given about two hours after meals in dyspepsia due to deficient secretion of Hydrochloric Acid; given before meals in cases of acid eructation and heartburn, to prevent excessive secretion of acid; used also in gargles; given internally also to diminish night sweating.

10 to 20 drops of a 38 p.c. solution of pure Hydrochloric Acid in a little simple Syrup at the beginning of a meal in the treatment of chronic diarrhœa.—*B.M.J.E.* '02, ii. 7.

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

Prescribing Notes.—*Usually given with aromatic or bitter infusions; for children, 1½ to 2 minims; 1 drm. in 8 oz. of Infusion of Roses or Decoction of Cinchona as a gargle for ulcerated sore throat.*

Official Preparations.—Used in the preparation of Extractum Ergotæ, Injectio Apomorphinæ Hypodermica and Liquor Morphinæ Hydrochloridi.

Foreign Pharmacopœias.—Austr., 12·5 p.c., sp. gr. 1·061; Belg., sp. gr. 1·037; Fr., Hung., Swiss and U.S., 10 p.c., about sp. gr. 1·049; Dutch, sp. gr. 1·067; Jap., 10 p.c., sp. gr. 1·050; Dan., Norw. and Swed., 10 p.c., sp. gr. 1·050 to 1·052; Ger., 12·5 p.c., sp. gr. 1·061; Ital., 8·07 p.c., sp. gr. 1·036; Russ., 8·2 p.c., sp. gr. 1·040; Mex., Acid 1, Water 3. Not in the others.

Tests.—Diluted Hydrochloric Acid has a specific gravity of about 1·052. When its neutralised or diluted aqueous solution is mixed with Silver Nitrate Solution, a curdy white precipitate insoluble in Nitric Acid, but readily soluble in Ammonia Solution and in Potassium Cyanide Solution is produced.

As the diluted Acid is directed to be prepared with the official Hydrochloric Acid, it is required to be free from the impurities mentioned under the concentrated Acid. It is officially required to contain 10·49 p.c. by weight of absolute Hydrochloric Acid, as indicated by titration with Normal Volumetric Sodium Hydroxide Solution.

ACIDUM HYDROCYANICUM DILUTUM.

DILUTED HYDROCYANIC ACID.

HCN, eq. 26·85.

Fr., Acide Cyanhydrique Dissous; Ger., Cyanwasserstoffsaure;
Ital., Acido Cianidrico; Span., Acido Cianhidrico Medicinal.

A clear, colourless liquid, possessing a characteristic odour somewhat resembling bitter almonds. It is officially required to contain 2 p.c. by weight of Hydrogen Cyanide, and may be prepared by the interaction of Potassium Ferrocyanide and Sulphuric Acid, or when only a small quantity is required occasionally, it may be convenient to prepare it extemporaneously from dry Silver Cyanide, as in the *U.S.P.*:—Silver Cyanide, 6 parts; Diluted Hydrochloric Acid (*B.P.*), 15·54 fluid parts; Distilled Water, 44·1 parts. Shake for a short time and filter. The product should contain 2 p.c. w/w of Hydrogen Cyanide.

It should be kept in dark amber-tinted, well-stoppered glass bottles, in a cool and dark place, the bottles being maintained in an inverted position.

Medicinal Properties.—As this Acid is a dangerous poison, it should never be prescribed undiluted. Moreover, a diluted solution retains its strength better than a strong one.

It is sedative, antispasmodic, allays vomiting, is useful in gastrodynia, in visceral neuralgias, in dyspeptic palpitations, but chiefly valuable in the dry resultless cough of asthma, phthisis and whooping-cough, and prevents the vomiting brought on by food in phthisis. Used externally to allay itching in urticaria, lichen, etc., if the skin be unbroken; as a **lotion,** 2 drm. to 8 oz. of Rose Water and Glycerin; as an **ointment,** from $\frac{1}{2}$ to 1 drm. to each oz. of Zinc ointment.

The **vapour** is sometimes applied to the eye, but it is more generally used as a sedative inhalation in the cough of laryngeal phthisis and in some spasmodic affections.

Dose.—2 to 6 minims = 0·12 to 0·36 c.c.

Prescribing Notes.—*Given in Almond Emulsion for cough; and with Sodium Bicarbonate, Bismuth Carbonate and Peppermint Water for dyspepsia.*

As the Acid is susceptible to the action of light and air, and is very volatile, it is the practice to keep it in amber-coloured bottles, stopper downwards.

Incompatibles.—Silver, Copper, and Iron salts, and Mercuric Oxide.

Official Preparations.—Used in the preparation of Tinctura Chloroformi et Morphinæ Composita.

Not Official.—Acidum Hydrocyanicum (*Scheele*). Brompton Cough Mixture, Mistura Acidi Hydrocyanici Composita.

Antidotes.—In cases of poisoning, the antidotes are fresh air and artificial respiration, with cold affusion; the recent precipitate obtained by swallowing 10 grains of Ferrous Sulphate, with 1 fl. drm. of Tincture of Ferric Chloride in 1 oz. of Water, followed by 20 grains of Potassium Carbonate dissolved in 1 oz. of Water; this will render insoluble 110 minims of *B.P.* Acid. Stimulants, Ammonia and Brandy; Hypodermic injection of Atropine, $\frac{1}{60}$ grain.

Suggested that in mines and places where Cyanide is used the following antidote should be kept ready: (1) 1 oz. of a 23 p.c. solution of Ferrous Sulphate; (2) 1 oz. of a 5 p.c. solution of Potassium Hydrate; (3) 30 grains of powdered Magnesium Oxide to be added to the above in half a pint of Water.—*L.* '01, ii. 497.

Injection of a 3 p.c. solution of Hydrogen Peroxide subcutaneously recommended in cases of poisoning by fumes of Hydrocyanic Acid.—*J.C.S.* '01, *Abs.* ii. 535.

Foreign Pharmacopœias.—Official in Belg., 2·0 p.c.; Dutch, 2 p.c.; Fr., 2 p.c.; Jap. 2 p.c.; Norw., 2 p.c.; Port., strength not given; Mex. (Acido cianhidrico medicinal; U.S., 2 p.c.; Span., 2 p.c. Not in the others. *See* also Aqua Amygdalæ Amaræ.

The *Brussels Conference* adopted a strength of 2 p.c. for Acidum Hydrocyanicum Dilutum.

Tests.—Hydrocyanic Acid has a specific gravity of about 0·997; the *U.S.P.* does not give a specific gravity; the acid is not included in the *P.G.* When Silver Nitrate Solution is added to its neutralised solution there is produced a white curdy precipitate, soluble in Potassium Cyanide Solution, in Ammonia Solution, and in Nitric Acid. A blue precipitate is produced when a mixture of Ferrous and Ferric salts in solution is added to the neutralised acid, followed by the addition of Sodium Hydroxide Solution and then an excess of Hydrochloric Acid.

The Acid is officially required to contain 1·98 p.c. by weight of absolute Hydrocyanic Acid as indicated by titration with Volumetric Silver Nitrate Solution after the liquid has been rendered alkaline by the addition of Sodium Hydroxide Solution; 1 gramme of the Acid should require 3·7 c.c. of Deci-normal Volumetric Silver Nitrate

Solution. This process of titration is not altogether satisfactory, and, moreover, estimates any Chloride present. A very useful method for determining the strength of Diluted Hydrocyanic Acid is:—Place 10 c.c. of Ammonia Solution in a beaker; add 40 c.c. of Water and 0·2 gramme of Potassium Iodide and 5 c.c. of the Acid to be tested; titrate with Volumetric Silver Nitrate Solution, of which 18·7 c.c. will be required for a 2 p.c. Acid. The presence of Hydrochloric Acid (a trace of which is understood to be purposely added by manufacturers to retard decomposition) will not affect the results of the test, and the end reaction is very definite.

The more generally occurring impurities are mineral residue, Sulphates and Chlorides. The mineral residue is readily determined by evaporating the fluid to dryness.

When diluted with Water and slightly acidified with Hydrochloric Acid Solution it should not yield a distinct turbidity on the addition of Barium Chloride Solution, and when acidified with Nitric Acid should not yield a distinct turbidity on the addition of Silver Nitrate Test-solution, indicating the absence of more than traces of Chlorides and Sulphates.

Volumetric Determination.—A weighed quantity of 5 grammes of the Acid is diluted to 50 c.c. with Water; 26·9 c.c. (26·84) of this solution, after the addition of 5 c.c. of Ammonia Water and 3 drops of Potassium Iodide T.S., should require for the production of a slight permanent precipitate the addition of not less than 10 c.c. Deci-normal Volumetric Silver Nitrate Solution, *U.S.P.*

The *B.P.* and *U.S.P.* Acids contain not less than 2 p.c. by weight of Absolute Hydrocyanic Acid.

Not Official.

BROMPTON COUGH MIXTURE.—Diluted Hydrocyanic Acid, 2½ minims; Solution of Morphine Hydrochloride, 7½ minims; Syrup of Tolu, 40 minims; Acid Infusion of Roses, to make 4 fl. drm.—*Pharm. Form.*

This has been incorporated in the *B.P.C.* under the title **Mistura Acidi Hydrocyanici Composita** with the *syn.* Brompton Hospital Mixture.

ACIDUM HYDROCYANICUM (SCHEELE) *B.P.C. Formulary* 1901 — A colourless liquid. Sp. gr. 0·994. It should contain 4 p.c. HCN, as volumetrically determined by Volumetric Silver Nitrate Solution; it should give no precipitate with Barium Chloride Solution, but with Silver Nitrate a white precipitate entirely soluble in boiling concentrated Nitric Acid.

Dose.—1 to 3 minims = 0·06 to 0·24 c.c.

This has been incorporated in the *B.P.C.* under the title **Acidum Hydrocyanicum Fortius.**

It is known that the weaker strengths of Hydrocyanic Acid keep better than the stronger, and the only practical use for a double strength Acid is to poison dogs or cats.

Not Official.

ACIDUM HYDROFLUORICUM.

A colourless liquid, usually redistilled, containing about 30 p.c. of Hydrofluoric Acid gas; owing to its action on glass it is usually stored in gutta-percha bottles.

It is strongly corrosive. Great caution must be used in handling this Acid, as contact with the liquid or gas may result in sores difficult to heal, or permanent destruction of tissue; no pain is felt until the injury is beyond remedy. It also gives off a pungent irritating vapour.

In experiments made to determine the most suitable indicator for the titration of Hydrofluoric Acid, Phenolphthalein Solution answered well with Potassium or Sodium Hydroxide. Rosolic Acid Solution was equally useful and had the additional advantage of being capable of use with Ammonia. Cochineal and Brazil Wood Solutions answered fairly well, but Methyl Orange Solution was useless. With Litmus Solution the colour change is somewhat complicated.—*P.J.* (3) xxv. 701.

ACIDUM HYDROFLUORICUM DILUTUM.—Dilute the 30 p.c. Acid so as to contain 0·2 p.c., and preserve in gutta-percha bottles.—*B.P.C. Formulary* 1901.

Dose.—5 to 20 minims = 0·3 to 1·3 c.c.

This has been incorporated in the *B.P.C.* giving the dose 5 to 15 minims.

AMMONII FLUORIDUM.—Colourless crystals soluble in Water. Given in hypertrophy of the spleen and in goitre as a ¾ p.c. solution, in doses of 5 to 20 minims = 0·3 to 1·3 c.c.

FERRI FLUORIDUM.—A mixture of Ferric and Ferrous Fluoride. A purplish-grey powder, insoluble in Water.

Under the proprietary titles of *Antitussin* and *Fluorrheumin*, bodies containing Fluorine have been introduced; the former as an application in whooping-cough, the latter for rheumatism.—*P.J.* '99, ii. 11; '00, ii. 775.

Fluoroform (CHF_3) is analogous in composition to Chloroform ($CHCl_3$), but contains the halogen Chlorine replaced by Fluorine (CHF_3). The pure product is at ordinary temperatures a gas, and is prepared by the action of Silver Fluoride on Iodoform, the gas being subsequently purified from Carbonic Oxide by passing through a solution of Cuprous Chloride. This gaseous Fluoroform was tested pharmacologically and proved to be very similar in action to Chloroform. The commercial article is a 2·8 p.c. aqueous solution of the gas, and it is in this form that it is generally employed. It possesses very little odour or taste, and is comparatively harmless even in large doses. It has been mostly used in cases of phthisis, lupus, and tuberculous diseases of the joints. It is administered in doses of 1 to 3 teaspoonfuls taken in Water 4 or 5 times a day.

Sodium Fluoride has been introduced in the treatment of tuberculosis and stated to possess distinct antiseptic properties. Toxic effects of same.—*P.J.* '99, ii. 235. The Fluorides have been used as preservatives of foods.

Solutions of **Sodium Silicofluoride** and the **Saluferbath**, which is a mixture of various silicofluorides, have been introduced as antiseptics—*B.M.J.E.* '03, i. 712.

Not Official.

ACIDUM HYPOPHOSPHOROSUM.

H_3PO_2, eq. 65·56.

A clear, colourless and odourless liquid, possessing an acid taste and an acid reaction to Litmus. It contains 30 p.c. of absolute Hypophosphorous Acid. It should be kept in dark amber-tinted, well-stoppered bottles and in a cool place.

Dose.—2 to 5 minims = 0·12 to 0·3 c.c.

A good preservative for preparations otherwise liable to change by oxidation.

Used principally in the manufacture of the Solution and Syrup of Iron Hypophosphite, etc.

Dissolve 8 oz. of Barium Hypophosphite (containing not less than 95 p.c. $Ba.2(PH_2O_2)\ H_2O$) in 36 fl. oz. of hot Distilled Water. Add slowly to the solution 17 fl. oz. of Diluted Sulphuric Acid, after which continue the addition, drop by drop, until no further turbidity is produced. Set aside in a warm place, and pass the clear liquid through a filter. Wash the precipitate by decantation with successive portions of hot Distilled Water, until the washings have no longer an acid reaction. Filter, unite the filtrates, and evaporate the liquid on a water-bath to the prescribed density. The product will weigh about 11½ oz.

The process is better than the treatment of Calcium Hypophosphite with Oxalic Acid. But still a pure Hypophosphorous Acid is a commercial desideratum.

Tyrer compares the Barium and Calcium methods, and decides in favour of Barium.—*P.J.* '96, ii. 94.

Used in the manufacture of the Solution and Syrup of Iron Hypophosphite, etc.

Foreign Pharmacopœias.—Official in U.S. contains 30 p.c. by weight; sp. gr. 1·130 at 25° C. (77° F.).

Tests.—Sp. gr. 1·1367. Its strength as determined by Volumetric Sodium Hydroxide Solution corresponds to 30 p.c. of absolute Hypophosphorous Acid. Its aqueous solution is not precipitated by Diluted Sulphuric Acid, nor by an excess of Ammonia Solution, nor by Ammonium Oxalate Solution after neutralisation, and gives not more than a faint opalescence with Barium Chloride Solution. If Magnesium Ammonio-sulphate Solution be added after an excess of Ammonia Solution, no precipitate is produced. Calcium Chloride Solution added to a neutralised solution yields no precipitate.

Heated with excess of Mercuric Chloride Solution and a little Hydrochloric Acid to 100° C. (212° F.), Calomel is precipitated, from the weight of which the percentage of Hypophosphorous Acid may be calculated.

As the reaction follows the equation $H_3PO_2 + 4HgCl_2 + 2H_2O = H_3PO_4 + 4HgCl + 4HCl$, 100 parts of Calomel produced are equivalent to 7 parts of Anhydrous Acid.

Acidum Hypophosphorosum Dilutum.—Hypophosphorous Acid, 20; Distilled Water, 40, both by weight.—*U.S.P.*

Sp. gr. 1·042 at 25° C. (77° F.) contains 10 p.c. by weight of absolute Hypophosphorous Acid.

Hypophosphorous Acid, 33; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

This is obviously intended to yield the same result as the *U.S.P.* given above, but in that case the quantities should be by weight and not by volume.

ACIDUM LACTICUM.

LACTIC ACID.

Fr., Acide Lactique; Ger., Milchsaure; Ital., Acido Lattico;
Span., Acido Lactico.

A colourless and odourless syrupy hygroscopic liquid, possessing a purely acid taste. It should contain 75 p.c. of Hydrogen Lactate, $HC_3H_5O_3$, eq. 89·37.

It is produced by the fermentation of Lactose, and is extracted in the form of Zinc Lactate, the latter salt being subsequently decomposed. It is also obtainable by various synthetical processes.

Solubility.—It is miscible in all proportions with Water, Alcohol (90 p.c.), and Ether. It dissolves, but is not dissolved by, Chloroform.

Medicinal Properties.—It is used as a 'swab' in diphtheria; a solution (50 to 75 p.c.) has been used successfully for pharyngeal and laryngeal tubercle, and for lupus after scraping.

50 p.c. solution applied to corneal ulcers.—*L.* '95, i. 1452.

A 2 p.c. solution is recommended in the treatment of laryngeal papillomata. —*B.M.J.* '04, ii. 1224.

Official Preparation.—Syrupus Calcii Lactophosphatis.

Not Official.—Calcii Lactas, Ferri Lactas, Plumbi Lactas, Sodii L., Zinci L., Bismuthi L., Acidum Lacticum Dilutum, Syr. Calcii Lactophosphatis c. Ferro.

Foreign Pharmacopœias.—Official in Fr., sp. gr. 1·24; Port. and Span., sp. gr. 1·215; Austr., Belg., Dan., Dutch, Ger., Ital., Jap., Norw., Russ., Swed. and Swiss, sp. gr. 1·21 to 1·22; U.S., sp. gr. 1·206 at 25° C. (77° F.); Mex., sp. gr. 1·315.

Tests.—Lactic Acid has a specific gravity of 1·210; the *U.S.P.* gives 1·206 at 25° C. (77° F.); the *P.G.* 1·210 to 1·220. It vaporises at a temperature above 148·9° C. (300° F.), giving off inflammable vapours at a temperature of 176·7° C. (350° F.), which on ignition burn with a blue flame. The readily recognised odour of Aldehyde is evolved when the Acid is warmed with Potassium Permanganate. The *B.P.* and *U.S.P.* employ for this test solid Potassium Permanganate, but the *U.S.P.* warms it with a mixture of equal volumes of the Acid, Potassium Permanganate, and Sulphuric Acid, whereas *B.P.* uses Lactic Acid and Potassium Permanganate; the *P.G.* uses a Potassium Permanganate Solution and Lactic Acid. It is officially required to contain 74·18 p.c. by weight of absolute Lactic Acid, as determined by titration with Volumetric Sodium Hydroxide Solution. It will therefore be noticed that the *B.P.* statement, 'a liquid containing 75 p.c. of Hydrogen Lactate,' is at variance with the volumetric determination. In the case of the Acid the *B.P.* has not distinctly specified 'per cent. by weight,' though this is clearly intended. Using the atomic weights official in the *B.P.* 1885 in calculating the result of the volumetric test, the official figure would indicate 74·7 p.c. by weight of absolute Acid. It seems, therefore, as if this were another instance in which the *B.P.*, after adopting new atomic weights, have omitted to bring their monographs into accordance with them. The test would read better, 'each gramme should require for neutralisation 8·4 c.c. of the Volumetric Sodium Hydroxide Solution.' The *U.S.P.* acid is required to contain not less than 75 p.c. by weight; the *P.G.* about 75 p.c. by weight of absolute Acid.

The more generally occurring impurities are heavy metals, *e.g.*, Arsenic, Copper, Lead and Iron, Sarco-lactic, Malic, and Sulphuric Acids, Glycerin, Cane, Grape or Milk Sugar, Fatty Acids, organic impurities, Calcium Phosphate, Gum, Mannite, mineral residue, Chlorides, Citrates, Oxalates, Phosphates, Sulphates, or Tartrates.

Heavy metals are grouped collectively in the *B.P.*; in the *U.S.P.* they are covered by the time-limit test, and by the Hydrogen Sulphide test described below. *B.P.* and *U.S.P.* test for Sarco-lactic Acid with Copper Sulphate Solution, but no similar test is included in the *P.G.*

Tests for Malic and Sulphuric Acids are not included in the *U.S.P.* or *P.G.* The *B.P.* uses Lead Subacetate Solution as a reagent requiring that no precipitate should be produced.

The tests adopted by the *B.P.* and *U.S.P.* in examining for Glycerin are essentially the same, and consist in converting the acid into a Zinc salt, drying and extracting with Absolute Alcohol; the *P.G.* does not include a test for Glycerin.

Cane, Grape and Milk Sugars are readily detected by their reducing action on Potassio-cupric Tartrate Solution, and the method of carrying out the test is essentially the same in the *B.P.* and *U.S.P.*, the latter Pharmacopœia definitely stating the relative quantities to be employed. The Fehling test does not appear in the *P.G.*

Foreign fatty acids are tested for in an almost identical manner by the three Pharmacopœias by warming the acid and observing the odour, as are also organic impurities by the Sulphuric Acid test, the *U.S.P.* and *P.G.* allowing a limit of time (15 minutes) within which no darkening in colour shall take place, and the *U.S.P.* in addition maintaining the temperature of the mixed Sulphuric and Lactic Acids at or below 15° C. (59° F.).

Advantage is taken of the insolubility of Calcium Phosphate, Gum, Mannite and Sugar in Ether to utilise the latter substance as a test for them in the Acid. The test appears in the *B.P.* and *P.G.*, but not in the *U.S.P.* The three Pharmacopœias differ in the amount of mineral residue permitted. The *B.P.* allows 0·5 p.c., the *P.G.* no weighable residue from 0·5 gramme, and the *U.S.P.* 1·0 p.c.

Chlorides, Citrates, Oxalates, Phosphates, Sulphates or Tartrates are readily detected by the tests given in the small type below under the respective headings of Silver Nitrate, Lime Water, and Barium Chloride.

Warming.—When gently warmed the Acid should not evolve the odour of rancid fat. Indicating the absence of Butyric and other fatty acids, *B.P.*, *P.G.* and *U.S.P.*

Potassium Permanganate.—On warming with Potassium Permanganate (Potassium Permanganate Solution, *P.G.*), Lactic Acid evolves the odour of Aldehyde, *B.P.* and *P.G.*; the *U.S.P.* test directs equal volumes of Lactic and Sulphuric Acids and Potassium Permanganate.

Sulphuric Acid.—If Lactic Acid be carefully poured on an equal volume of Sulphuric Acid in a clean test-tube (previously rinsed out with Sulphuric Acid, *P.G.*), no darkening in colour should occur (*B.P.*) within 15 minutes, indicating the absence of more than traces of organic impurities, *P.G.* and *U.S.P.* *U.S.P.* also directs that the temperature be maintained at or below 15° C. (59° F.).

Copper Sulphate Solution.—Diluted with Water (1–10 *P.G.* and *U.S.P.*) Lactic Acid should be unaffected by Copper Sulphate T.S., indicating the absence of Sarco-lactic Acid, *B.P.* and *U.S.P.*

Potassio-cupric Tartrate Solution.—Diluted with Water the Acid should give no precipitate, or only the slightest, even after prolonged boiling with Potassio-cupric Tartrate Solution, *B.P.*; the *U.S.P.* orders a few drops of the Acid to be added to 10 c.c. of the hot Alkaline Cupric Tartrate Volumetric Solution, indicating the absence of Grape, Cane and Milk Sugars.

Zinc Carbonate.—If Lactic Acid be heated with an excess of Zinc Carbonate and evaporated to dryness (dried at 100° C. (212° F.), *U.S.P.*), and if this mixture be exhausted with Absolute Alcohol, and the alcoholic liquid evaporated, no sweet residue should be left, indicating the absence of Glycerin, *B.P.* and *U.S.P.*

Ether.—If Lactic Acid be added drop by drop to twice its volume of Ether, the mixture should not show any permanent or transient turbidity, indicating absence of Gum, Sugar, Mannite, Calcium Phosphate, *B.P.* and *P.G.*

Volumetric Determination.—One gramme neutralises 8·3 c.c. of the Volumetric Sodium Hydroxide Solution, *B.P.* If 5 grammes be diluted to 50 c.c. with Water, then 44·7 c.c. of this solution should require for complete neutralisation at boiling temperature not less than 37·5 c.c. of Potassium Hydroxide Solution (each c.c. = 2 p.c. absolute Lactic Acid); Phenolphthalein T.S. being used as indicator, *U.S.P.*

Barium Chloride or Nitrate Solution.—10 c.c. of an aqueous solution of a strength of 1 in 20 should be unaffected by 1 c.c. of Barium Chloride Test-solution, *U.S.P.*; or by Barium Nitrate Solution, *P.G.*; indicating the absence of Sulphates.

Hydrogen Sulphide Solution.—An aqueous solution of a strength 1 in 10 shall not be altered by the addition of Hydrogen Sulphide Solution, *P.G.*; nor should an aqueous solution of similar strength respond to the time-limit test for heavy metals, *U.S.P.*; indicating the absence of Arsenic, Copper, Lead and Iron.

Silver Nitrate Solution.—An aqueous solution of a strength of 1 in 10 shall not be altered by the addition of Silver Nitrate Solution, *P.G.*; 10 c.c. of an aqueous 1 in 100 solution should not be rendered opalescent by 1 c.c. of Silver Nitrate Solution, *U.S.P.*

Ammonium Oxalate Solution.—An aqueous 1 in 10 solution shall not be altered by the addition of Ammonium Oxalate Solution, indicating the absence of Calcium, *P.G.*

Lime Water.—An aqueous 1 in 10 solution shall not be altered by the addition of excess of Lime Water even on heating, *P.G.*

Preparation.

SYRUPUS CALCII LACTOPHOSPHATIS. SYRUP OF CALCIUM LACTOPHOSPHATE.

Precipitated Calcium Carbonate, 2½ oz.; Concentrated Phosphoric Acid, 4 fl. oz. and 262 minims; Lactic Acid, 6 fl. oz.; Refined Sugar, 70 oz.; Orange Flower Water of commerce, undiluted, 2½ fl. oz.; Distilled Water, sufficient to produce 100 fl. oz. of Syrup.

The Lactic Acid is diluted with four times its volume of Distilled Water, and the Calcium Carbonate is added in small portions. As soon as the Carbonate is completely in solution the concentrated Phosphoric Acid is added and trituration continued until the precipitate at first formed redissolves. The solution is diluted with some Distilled Water, the undiluted Orange Flower Water added, and the mixture filtered. The Refined Sugar is dissolved without the aid of heat in the filtrate, strained, and sufficient Distilled Water added to produce 100 fl. oz. of Syrup.

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

The occasional change of colour in this syrup is stated to be due to inversion of the Sugar by the Acid.—*P.J.* '99, ii. 221; *A.J.P.* '98, 589.

Foreign Pharmacopœias.—Official in Belg., contains 1·5 p.c. Bi-Calcic Phosphate; Mex., and Span. contain 1·25 p.c. by weight of Bi-Calcic Phosphate; Swiss and U.S. from Calcium Carbonate, *see* below.

Not Official.

ACIDUM LACTICUM DILUTUM.—Lactic Acid, 3 fl. oz.; Distilled Water, *q.s.* to produce 20.—*B.P.* 1885.

This has been incorporated in the *B.P.C.*

SYRUPUS CALCII LACTOPHOSPHATIS.—Precipitated Calcium Carbonate, 2·5; Lactic Acid, 6; Phosphoric Acid, 3·6; Orange Flower Water, 5; Sugar, 72·5; Water, *q.s.* to make 100.—*U.S.P.*

Calcium Carbonate, 1; Lactic Acid, 2·4; Diluted Phosphoric Acid, 2; Simple Syrup, 80; Water, *q.s.* to make 100. All by weight.—*Swiss.*

SYRUPUS CALCII LACTOPHOSPHATIS C. FERRO.—Ferrous Lactate, 8·5; Potassium Citrate, 8·5; Water, 62·5; Syrup of Calcium Lactophosphate (*U.S.P.*), *q.s.* to make 1000.—*U.S.N.F.* 1906.

The *B.P.C.* has incorporated the formula of the *U.S.N.F.* 1896, but employs *B.P.* Syrup of Calcium Lactophosphate in place of the *U.S.P.* Syrup as follows:—

Ferrous Lactate, 0·85; Potassium Citrate, 0·85; Distilled Water, 6; Syrup of Calcium Lactophosphate, *q.s.* to make 100.

Other Not Official salts of Lactic Acid are:—**Plumbi Lactas,** a heavy white crystalline powder, soluble in Water. **Sodium Lactate,** a colourless or light yellow liquid of a syrupy consistency and mild salty taste; readily soluble in Water; commercial samples frequently contain an undesirable excess of alkali in the form of Sodium Carbonate. **Zinc Lactate,** a white crystalline powder, or in glistening needle-shaped crystals; it has been used internally, in doses of 1 to 3 grains = 0·06 to 0·2 gramme, four or five times a day in the treatment of epilepsy.

CALCII LACTAS.—White, mammillated tufts; or as a white odourless powder. Soluble 1 in 10 of Water, but solubility varies with the age of the preparation. Insoluble in Ether. Given in rachitis and scrofula, and in chilblains. As it increases the coagulability of the blood, it is given in hæmophilia, and before surgical operations on those who bleed unduly.

Dose.—3 to 10 grains = 0·2 to 0·65 gramme. Also combined with Ferri Lactas.

Foreign Pharmacopœias.—Official in Belg., Ital. and Span.

FERRI LACTAS.—Pale greenish-white crusts consisting of some needle-shaped crystals, or as a crystalline powder. Odourless when quite pure, but usually possessing a mild, peculiar odour and sweet, ferruginous taste. It should be kept in well-stoppered bottles, as it tends to oxidise on exposure to air.

Solubility.—1 in 40 of cold Water, 1 in 12 of hot Water.

Dose.—5 to 15 grains = 0·32 to 1 gramme. In the form of a cachet or as a syrup.

Foreign Pharmacopœias.—Official in all except U.S.

Tests.—Aqueous solutions of the salt give a deep blue precipitate with Potassium Ferricyanide, and a light blue precipitate with Potassium Ferrocyanide Solutions. When dissolved in diluted Sulphuric Acid and gently warmed after the addition of a little Potassium Permanganate the odour of Aldehyde is evolved.

1 gramme of the salt moistened with Nitric Acid and carefully ignited should leave a residue of Ferric Oxide amounting to not less than 0·27 gramme, indicating 27·0 p.c. of Iron Oxide. This residue should not be alkaline in reaction to Litmus paper.

25 c.c. of a 1 in 50 aqueous solution of the salt after being boiled for a few minutes with 5 c.c. of diluted Sulphuric Acid, the Iron precipitated with an excess of Potassium Hydroxide Solution and filtered, the filtrate when boiled with a few drops of Potassio-cupric Tartrate Solution should afford no reddish precipitate, indicating the absence of Sugar.

On trituration of a portion of the salt with strong Sulphuric Acid, no disagreeable odour should be evolved, no gas should be disengaged, nor should the mixture assume a dark colour after standing for some time. These tests show respectively the absence of fatty acids, Carbonates, and readily carbonisable organic impurities. A 1 in 50 aqueous solution of the salt should not produce more than a whitish opalescence with either Lead Acetate Solution or with Hydrogen Sulphide Solution after acidification with Hydrochloric Acid, indicating the absence of more than traces of Chloride, Citrate, Malate, Sulphate, Tartrate, and of heavy metals.

A 1 in 50 aqueous solution acidulated with dilute Nitric Acid shall yield no reaction with either Silver Nitrate Solution or with Barium Nitrate Solution, affording additional evidence of the absence of Chlorides and Sulphates.

The salt on being strongly heated evolves a caramel-like odour, when more strongly heated gives off dense white fumes and finally leaves a brownish-red residue.

ACIDUM NITRICUM.

NITRIC ACID.

Fr., Acide Azotique; Ger., Salpetersaure; Ital., Acido Nitrico Concentrato; Span., Acido Nitrico.

A clear, colourless fuming liquid, which evolves characteristic choking fumes, and possessing even in diluted solutions a strongly acid and corrosive action.

It may be prepared by the decomposition of a Nitrate, generally Sodium or Potassium Nitrate by Sulphuric Acid.

It is officially required to contain 70 p.c. by weight of Hydrogen Nitrate, $\mathbf{HNO_3}$, eq. 62·58.

It should be preserved in well-stoppered bottles, and in a cool place.

Medicinal Properties.—It is strongly corrosive, and is applied as a caustic to warts, phagedænic sores, chancres, and condylomata, by means of a pointed glass rod. When diluted it is refrigerant, a stomachic tonic and cholagogue, and if very much diluted forms a drink in febrile diseases, and is used also as an injection to dissolve phosphatic calculi when of small size.

An acid of greater strength, '**Fuming Nitric Acid**' (sp. gr. 1·5), is sometimes employed as a caustic.

Incompatibles.—Alcohol, Alkalis, Carbonates and Sulphides, Ferrous Sulphate, Lead Acetate.

Official Preparations.—Acidum Nitricum Dilutum and Acidum Nitrohydrochloricum Dilutum. Used in the preparation of Acidum Phosphoricum Concentratum, Argenti Nitras, Liquor Ferri Perchloridi Fortis, Liquor Ferri Pernitratis, Liquor Ferri Persulphatis, Liquor Hydrargyri Nitratis Acidus, Spiritus Ætheris Nitrosi, Unguentum Hydrargyri Nitratis.

Antidotes.—In case of poisoning by Nitric Acid, the antidotes are Chalk, Magnesia, or Carbonated Alkalis, with White of Egg, Carron Oil, or Soap-suds; followed by enemata of Beef Tea and Brandy, with Tincture of Opium to prevent collapse; emollient drinks.

Foreign Pharmacopœias.—Official in Austr., sp. gr. 1·300, Dan. and Norw., sp. gr. 1·180; Dutch, sp. gr. 1·316; Belg., sp. gr. 1·390; Fr., sp. gr. 1·394; Ger., Jap. and Swed., sp. gr. 1·153; Hung., sp. gr. 1·310; Ital., sp. gr. 1·400; Mex., sp. gr. 1·42; Port., sp. gr. 1·300 to 1·330; Russ., sp. gr. 1·200; Span., sp. gr. 1·31; Swiss, sp. gr. 1·151; also Acidum Nitricum Fumans, sp. gr. 1·45 to 1·5; U.S., sp. gr. 1·403 at 25° C. (77° F.). Austr., Dan., Ger., Jap. and Norw., also Acidum Nitrico-nitrosum, sp. gr. 1·48 to 1·50.

Fr., Ger., Jap., Russ., Swed. and Swiss have an **Acidum Nitricum Crudum.**

Tests.—Nitric Acid has a specific gravity of 1·420; the *B.P.* states 1·42; the *U.S.P.* about 1·403 at 25° C. (77° F.); the *P.G.* 1·153. The boiling point should be about 120° C. (250° F.); the *B.P.* states 121° C. (250° F.); the *U.S.P.* 120·5° C. (248° F.). It evolves dense red fumes when brought into contact with metallic Copper; it produces a dark brown coloration at the junction of the two liquids when a solution of the Acid is poured carefully upon a cooled mixture of Ferrous Sulphate and Sulphuric Acid, and when neutralised discharges the colour of a Sulphuric Acid Solution of Indigo, rapidly when warmed. The Acid is officially required to contain 69·46 p.c. of absolute Nitric Acid as indicated by titration with Volumetric Sodium Hydroxide Solution. As in the case of Lactic Acid, so here it would appear as if the atomic weights official in *B.P.* 1885 were employed in determining the number of c.c. of Volumetric Solution equivalent to the 1 gramme of Acid used, the yield of absolute Acid corresponding to 11·1 c.c. when so calculated being 69·93 p.c.

Calculating with the atomic weights of the 1898 Pharmacopœia, 11·2 c.c. would have been a nearer equivalent, which shows 70·08 p.c. of absolute Acid. The *U.S.P.* requires it to contain 68 p.c. by weight of absolute Acid; the *P.G.* 25 p.c. by weight.

The more generally occurring impurities are Arsenic, Copper, Lead and Iron, Bromic Acid or Bromine, Chlorides, Iodic Acid or Iodine, Sulphates and mineral residue. These are covered in the *B.P.* by the customary elastic expression; it should yield no characteristic reaction with the tests mentioned in the Appendix for those substances. Both *U.S.P.* and *P.G.* indicate the dilutions of the Acid to be employed, and in particular cases also the quantity of reagent to be used. The *U.S.P.* gives the modified Gutzeit test for Arsenic, and the time-limit test for heavy metals. A standard of 5 parts per million by weight is suggested (*C.D.* '08, i. 795) for Arsenic; but 20 parts per million (by weight) is suggested for Lead, on account of the property of dissolving Lead from glass which this acid possesses. *P.G.* gives a special test for Iron, with Potassium Ferrocyanide Solution. In testing for Iodic Acid it will be noticed that the *U.S.P.* uses metallic Tin for the reduction, and the *P.G.* metallic Zinc.

The Pharmacopœias differ in the amount of mineral residue permitted. The *B.P.* states first that it shall yield no residue, and then 'not more than 0·005 p.c.'; the *P.G.* omits all reference to the residue remaining after evaporation; whilst the *U.S.P.* states explicitly that 10. c.c. on evaporation to dryness, and further heated to 110° C. (230° F.), should leave no appreciable residue.

Modified Gutzeit Test.—5 c.c. of a 1 in 10 aqueous solution of Nitric Acid should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Potassium Ferrocyanide Solution.—10 c.c. of a 1 in 10 aqueous solution should not be immediately turned blue on the addition of 0·5 c.c. Potassium Ferrocyanide Solution, *P.G.*

Chloroform.—Nitric Acid diluted 1–3, with a small piece of Zinc introduced for a short time, should not, on agitation with a small quantity of Chloroform, colour the Chloroform violet, *P.G.*

The *U.S.P.* directs such a diluted Acid to be shaken with a few drops of Chloroform, which should remain colourless (absence of Iodine and Bromine) even after the introduction of a small piece of Tin (absence of Iodic and Bromic Acids).

Hydrogen Sulphide Solution.—An aqueous 1 in 6 solution nearly neutralised with Ammonia Solution shall not be altered by the addition of Hydrogen Sulphide Solution, *P.G.* When neutralised with Ammonia Solution and diluted with Distilled Water 1 to 20, the Acid should not respond to the time-limit test for heavy metals.

Barium Chloride or Nitrate Solution.—A 1 in 6 aqueous dilution of the Acid should not become more than opalescent within 5 minutes with Barium Nitrate Solution, *P.G.* A separate portion of a 1 in 10 aqueous dilution should be unaffected by Barium Chloride Test Solution, *U.S.P.*

Silver Nitrate Solution.—A 1 in 6 aqueous dilution should not be affected by Silver Nitrate Solution, *P.G.* A 1 in 10 aqueous dilution should be unaffected by Silver Nitrate Test Solution, *U.S.P.*

Volumetric Determination.—One gramme neutralises 11·1 c.c. of the Volumetric Sodium Hydroxide Solution, *B.P.*; 5 c.c. should require 22·9 c.c. of the Normal Volumetric Potassium Hydroxide Solution, *P.G.* The *U.S.P.* directs that 3 c.c. of Nitric Acid be accurately weighed, diluted to 50 c.c. with Water and titrated with Normal Volumetric Potassium Hydroxide Solution, using Methyl Orange Solution as an indicator. The number obtained by multiplying the number of c.c. of Alkali used by 6·257 and dividing this product by the weight of Acid taken represents the percentage of absolute Acid present.

Preparations.

ACIDUM NITRICUM DILUTUM. Diluted Nitric Acid.

A clear, colourless acid liquid, prepared by diluting 3 fl. oz. and 7 fl. drm. of Nitric Acid with Distilled Water to make 20 fl. oz.

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

5 minims contain about 1 minim of strong Acid.

Prescribing Notes.—*Usually diluted with Water or with bitter infusions and Tincture of Orange.*

Foreign Pharmacopœias.—Official in Belg., sp. gr. 1·072; Dutch, sp. gr. 1·133; Hung., sp. gr. 1·067; Ital., sp. gr. 1·1; Russ., sp. gr. 1·096; Fr., Jap. and Swiss, sp. gr. 1·056; U.S., sp. gr. 1·054 at 25° C. (77° F.). Not in the others. Dan., Norw. and Swed., *see* Acidum Nitricum.

Tests.—Diluted Nitric Acid has a specific gravity of 1·101; the *U.S.P.* states 1·054 at 25° C. (77° F.); the *P.G.* does not include a diluted Acid. It is officially required to contain 16·89 p.c. w/w of Hydrogen Nitrate as indicated by titration with Volumetric Sodium Hydroxide Solution; 1 gramme neutralising 2·7 c.c. The number of c.c. required to neutralise 1 gramme of the diluted Acid seems to have been based on the atomic weights official in the *B.P.* 1885, and using these latter would calculate to 17·01 p.c. of Hydrogen Nitrate. Each gramme should require for neutralisation 2·8 c.c. of the Volumetric Solution would have been more consistent with the statement of strength (17·4 p.c.) given in the official description of the diluted Acid.

As Nitric Acid (*B.P.*) is employed in its preparation, the diluted Acid is naturally required to answer the principal characteristic qualitative tests for Nitric Acid, and also be free from the impurities mentioned under the concentrated Acid.

ACIDUM NITRO-HYDROCHLORICUM DILUTUM. Diluted Nitro-Hydrochloric Acid.

Nitric Acid, 3; Hydrochloric Acid, 4; Distilled Water, 25.

A clear, colourless, or pale yellow liquid, possessing a strong acid taste and faint chlorinous odour.

B.P. directs the Acids to be mixed with the Water and kept for 14 days before use; but scarcely any action takes place between the diluted Acids, free Chlorine and Nitrous Acid existing only in *traces*.

When the strong Acids were mixed, and after 3 days diluted, the resulting fluid liberated about fifty times as much Iodine from Potassium Iodide Solution as the *B.P.* preparation.

Medicinal Properties.—Cholagogue and gastric tonic. Externally as a **lotion** or **bath,** as well as by stomach administration for tropical enlargement and chronic congestion of the liver. Internally also in biliousness, in oxaluria, and in torpid conditions of stomach, intestinal glands and liver; and in catarrhal jaundice,

Nitro-Hydrochloric Acid Bath.—Mix 8 oz. by measure of Diluted Nitro-Hydrochloric Acid with 1 gallon of Water, temperature 96° or 98° F. Let a flannel roller of ten or twelve inches wide, and sufficient to encircle the body twice, be soaked in the fluid and then wrung, so as to remain only damp. Apply this instantly to the body, covering it with a piece of oiled silk to avoid damping the dress. It should be worn constantly, but should be changed, soaked, and wrung morning and evening. Glass, glazed earthenware, or wooden vessels should be used. Sponges and towels to be kept in Water to prevent them corroding.

The St. Thomas's Hospital employ ½ oz. of the Diluted Nitro-Hydrochloric Acid to the gallon for a full size bath of 25 to 30 gallons, and this has been incorporated in the *B.P.C.*

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

Prescribing Notes.—*Usually diluted with Water and given with Tincture of Gentian or Tincture of Orange, and Tincture of Nux Vomica.*

16 *minims equal* 1½ *minims of Nitric Acid and* 2 *minims of Hydrochloric Acid.*

Incompatibles.—Alkalis, Carbonates, Sulphides, salts of Silver and Lead.

Antidotes.—*See* Acidum Nitricum.

Foreign Pharmacopœias.—U.S. orders the undiluted—Nitric Acid, 18; Hydrochloric Acid, 82; also the diluted—Nitric Acid, 4; Hydrochloric Acid, 18; Water, 78.

Norw., Nitric Acid, 1; Hydrochloric Acid, 2. By weight. *Syn.* Aqua Regia.

Dublin Pharmacopœia was—Nitric Acid, 1; Muriatic Acid, 2.

Not in the other Pharmacopœias.

Tests.—Diluted Nitro-Hydrochloric Acid has a specific gravity of about 1·07. 1 gramme should require for neutralisation about 2·5 c.c. of Volumetric Sodium Hydroxide Solution. When mixed with Potassium Iodide Solution, Iodine is liberated, which is readily recognised by the colour produced with Starch Solution.

ACIDUM OLEICUM.

OLEIC ACID.

Fr., Acide Oléique; Ger., Oleinsaure; Ital. and Span., Acido Oleico.

A pale brownish-yellow, oily liquid, which has a tendency to become rancid and to darken in colour on exposure to light and air. Pure Oleic Acid is represented by the formula $\mathbf{HC_{18}H_{33}O_2}$, eq. 280·14, but the commercial article is usually not quite pure.

It is prepared from the Olein of fats, in which it exists as a Glyceryl ester, by saponification or hydrolysis, the former being accomplished by the Hydroxides of the fixed alkalis, the latter by the influence of superheated steam. After saponification the Oleate formed is decomposed by a mineral Acid.

It should be preserved in well-stoppered, dark amber-tinted glass bottles.

Solubility.—Mixes in all proportions with Alcohol, Chloroform, Ether, Benzol, Oil of Turpentine, and fixed Oils. Insoluble in Water.

Medicinal Properties.—Used in pharmacy for dissolving various metallic oxides and the alkaloids Morphine, Aconitine, Atropine, Cocaine, and Veratrine; the oleates thus formed are more readily absorbed than ointments made with fats, oils, or paraffins.

Official Preparation.—Hydrargyri Oleas. Used in the preparation of Unguentum Aconitinæ, Unguentum Atropinæ, Unguentum Cocainæ, and Unguentum Veratrinæ. Of **Mercuric Oleate,** Unguentum Hydrargyri Oleatis.

Foreign Pharmacopœias.—Official in Jap. (Acidum Oleinicum), sp. gr. about 0·9; Mex. (Acido Oleico); U.S., sp. gr. 0·895 at 25° C. (77° F.). Not in the others.

Tests.—Oleic Acid has a specific gravity of from 0·890 to 0·910; the *U.S.P.* states 0·895 at 25° C. (77° F.). The solidifying point is 4·5 to 5° C. (40° to 41° F.), subsequently melting at 13·3 to 15·5° C. (56° to 60° F.); the *U.S.P.* states that it becomes semi-solid when cooled to from 9° to 4° C. (48·2° to 39·2° F.) and congeals to a whitish solid on further cooling. It has a peculiar characteristic odour. The acid may be determined by titration with Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. 1 gramme of the acid should require about 3·5 c.c. of Volumetric Sodium Hydroxide Solution, indicating 98·0 p.c. of absolute Oleic Acid. No volumetric assay is included in either the *U.S.P.* or *B.P.*

The most likely impurities are fixed oils, Stearic and Palmitic Acids. The solubility in Alcohol (90 p.c.) detects the presence of fixed oils; though the solubility is not specifically mentioned as a test for these in the *B.P.*; advantage is taken of the comparative insolubility of Lead Stearate and Lead Palmitate in Ether to use this agent as a test for the presence of these two Acids.

The *U.S.P.* states that heated to a temperature of 95° C. (203° F.) decomposition commences; on heating to a higher temperature it is entirely dissipated.

The Acid is not official in the *P.G.*

Solubility in Alcohol.—The *U.S.P.* requires that an alcoholic solution of the Acid should have a feebly acid reaction on blue Litmus paper, and that equal volumes of Acid and Alcohol should form a clear solution at 25° C. (77° F.) without the separation of oily drops, indicating absence of fixed oils.

Lead Acetate Solution.—A weighed quantity of 1 gramme of Oleic Acid is dissolved in about 20 c.c. of Alcohol (94·9 p.c.) and 2 drops of Phenolphthalein Solution added. The mixture is warmed and saponified by the addition drop by drop of a Solution of Sodium Hydroxide (1–4) until the Acid is neutralised, and the mixture after agitation remains a permanent red colour. Then gradually add Acetic Acid until the red tint is discharged, filter, and mix 10 c.c. of the filtrate with 10 c.c. purified Ether. This solution should not become any more than slightly turbid with 1 c.c. of Lead Acetate Solution, indicating the absence of notable quantities of Stearic and Palmitic Acids, *U.S.P.*

An almost identical test is employed by the *B.P.* for the detection of more than traces of these acids.

Not Official.

ACIDUM STEARICUM. Stearic Acid. $HC_{18}H_{35}O_2$, eq. 282·14.—A hard white glistening solid, possessing very little odour or taste. It is an organic acid appearing commercially in a more or less impure form as Stearine. It is a monobasic acid. It is insoluble in Water, soluble in Alcohol (90 p.c.), and readily dissolves in Ether.

Tests.—Stearic Acid melts at 69·2° C. (156·6° F.). This melting point is given in the *U.S.P.*, which further states that the commercial acid should have a melting point not lower than 56° C. (132·8° F.). The solidifying point of the commercial acid should not be lower than 54° C. (129·2° F.). It may be determined volumetrically by titration of a weighed quantity with Normal Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. 1 c.c. of the Volumetric Solution corresponding to 0·28214 gramme of pure Stearic Acid. Hydrocarbon oils and unsaponified fat are the more generally occurring impurities. If present in more than traces both are readily detected by the saponification test. If 1 gramme of the acid be saponified by boiling with a solution of 0·5 of a gramme of exsiccated Sodium Carbonate in 30 c.c. of Water, the resulting liquid should not be more than opalescent. It should leave no weighable residue when ignited with free access of air, indicating the absence of mineral matter, Soap, etc.

Not Official.

ACIDUM OSMICUM.

OSMIC ACID.

OsO_4.

Fr., Acide Osmique ; Ger., Osmiumsäure.

A pale yellow crystalline substance giving off an excessively irritating vapour, which attacks the eyes and nostrils. It is more convenient in the form of 1 p.c. aqueous solution, which must be carefully protected from dust or organic matter which will reduce it and form a black deposit.

Solubility.—1 in 17 Water. Should not be dissolved in Alcohol or Ether, as decomposition ensues.

Medicinal Properties.—4 to 10 minims of a 1 p.c. **aqueous solution** of Osmic Acid or Potassium Osmate have been injected hypodermically for sciatica and other forms of neuralgia.

5 to 10 minims in two or three separate injections in certain forms of neuralgia.—*L.* '99, ii. 1250 ; '03 ii. 970.

In trigeminal neuralgia the main branches of the fifth nerve were exposed, and a few drops of a 2 p.c. solution injected at several points.—*M.P.* '04, ii. 470. Injected into Gasserian ganglion.—*L.* '07, ii. 1603.

Used as 1 p.c. **aqueous solution** for fixing and staining in histological work. Fat and nerve tissues are blackened by it.

Foreign Pharmacopœias.—Official in Mex.

Not Official.

ACIDUM OXALICUM.

$H_2C_2O_4$, $2H_2O$, eq. 125·10.

Fr., Acide Oxalique ; Ger., Oxalsäure ; Ital., Acido Ossalico.

This is noticed here rather as a poison than a medicine, although it has been used in America in the treatment of amenorrhœa, and as a sedative in acute cystitis (*T.G.* '91, 164) in ½-grain doses every four hours. It is used in households for cleaning brass, and removing ink-stains, iron-moulds, etc. It has been mistaken for Epsom Salts, which it somewhat resembles. Murrell states that death has occurred from 2 drm., but recovery from ½ oz.

Antidotes.—Chalk, Lime, or Whitening are given freely in Water. Saccharated Solution of Lime may be given in drm. doses, frequently repeated; also emollient and stimulant drinks.

Foreign Pharmacopœias.—Official in Mex. and Port.

ACIDUM PHOSPHORICUM CONCENTRATUM.

CONCENTRATED PHOSPHORIC ACID.

Fr., Acide Phosphorique Officinal; Ger., Phosphorsäure; Ital., Acido Fosforico; Span., Acido Fosforico.

A clear, colourless, and odourless syrupy liquid, containing 66·3 p.c. of Hydrogen Orthophosphate, $\mathbf{H_3PO_4}$, eq. 97·32.

It is prepared from Phosphorus by oxidation. The official method is stated to be the oxidation, by means of Nitric Acid, of the aqueous solution of the residue from the atmospheric oxidation of Phosphorus. The more general method of production is the direct oxidation of Phosphorus by means of Nitric Acid.

It should be preserved in well-stoppered glass bottles, preferably of an amber tint.

Medicinal Properties.—This concentrated Acid is used in making phosphatic preparations. Only given internally in the diluted form. *See* Acidum Phosphoricum Dilutum.

Official Preparations.—Acidum Phosphoricum Dilutum. Used in the preparation of Acidum Hydrobromicum Dilutum, Ammonii Phosphas, Syrupus Calcii Lactophosphatis, Syrupus Ferri Phosphatis, and Syrupus Ferri Phosphatis cum Quinina et Strychnina.

Foreign Pharmacopœias.—Official in Austr., sp. gr. 1·12 (20 p.c.); Belg., 1·056 to 1·057 (10 p.c.); Fr. and Ital., sp. gr. 1·349 (50 p.c.); Dutch, sp. gr. 1·153 (25 p.c.); Ger. and Russ., sp. gr. 1·154 (25 p.c.); Jap., Hung., sp. gr. 1·120 (20 p.c.); Mex., 1·34; Port., sp. gr. 1·880; Span., sp. gr. 1·35 (50 p.c.); U.S., sp. gr. not below 1·707 at 25° C. (77° F.) (85 p.c.). Not in the others.

Tests.—Phosphoric Acid has a specific gravity of 1·5; the *U.S.P.* acid 1·707 at 25° C. (77° F.); the *P.G.*, 1·154. A white crystalline precipitate is produced when its diluted neutralised aqueous solution is mixed with Magnesium Ammonio-sulphate Solution. A yellow precipitate soluble in Ammonia Solution is produced when its diluted aqueous solution acidified with Nitric Acid is treated with Ammonium Molybdate Solution containing free Nitric Acid. A canary-yellow precipitate readily soluble in Ammonia Solution, and in cold dilute Nitric Acid is produced when Silver Ammonio-nitrate Solution is added to a dilute neutralised aqueous solution of the Acid. The Acid is officially required to indicate when assayed according to the Lead process given below, 66·3 p.c. of Hydrogen Orthophosphate; the *U.S.P.* Acid should contain 85 p.c. by weight of absolute Orthophosphoric Acid; the *P.G.* contains 25 p.c. of pure Acid. The process of determination adopted by the *B.P.* is a gravimetric one, and consists in converting the Phosphoric Acid into a Lead salt by means of Lead Oxide, evaporating and heating the residue to dull redness. A weighed quantity of 1 gramme of the Acid treated with 2·5 grammes of finely powdered Lead Oxide is required to yield a residue weighing 2·98 grammes. As pointed out in the 17th Edition of the *Companion* the percentage acidity of Phosphoric Acid may be conveniently determined by titration with standard alkali, using Phenolphthalein Solution as an indicator; the change of colour takes place when two-thirds of the Hydrogen is replaced by alkali metal; with Methyl Orange Solution as the indicator, neutrality is reached with half the quantity of alkali; with Litmus Solution the end reaction is too indefinite. The process adopted by the *U.S.P.* is volumetric, Normal Volumetric Sodium Hydroxide Solution being employed and Phenolphthalein Test-solution used as an indicator of neutrality. A definite weight of the Acid is diluted with Water, and the quantity removed for the determination is then diluted with about an equal quantity of a cold aqueous solution containing 5 grammes of Sodium Chloride. The *P.G.* gives neither a gravimetric nor a volumetric process of determination.

The more generally occurring impurities are Meta- and Pyrophosphoric Acids, Phosphorous Acid, Arsenic, heavy metals (*e.g.*, Copper, Iron, and Lead), Calcium, Chlorides, Sulphates, Phosphates, and Nitrates. The *B.P.* are content to include most of these under the general expression it 'shall yield no characteristic reaction,' etc.

The *B.P.* and the *U.S.P.* employ Albumen Solution for proving the absence of Meta-phosphoric Acid, and Tincture of Ferric Chloride for proving the absence of Pyro-phosphoric and Meta-phosphoric Acids. The tests in each Pharmacopœia are virtually the same, requiring that when diluted with 5 volumes of Water no precipitate should be produced on the addition of Albumen Solution, nor should any precipitate be formed, even after several hours, on the addition of an equal volume of Tincture of Ferric Chloride.

Individual tests for Arsenic are given by the *U.S.P.* and *P.G.*, the former employing the modified Gutzeit's test, the latter Solution of Stannous Chloride. Both these Pharmacopœias employ Hydrogen Sulphide for the detection of heavy metals, the *U.S.P.* adopting the time-limit test. In testing for Nitrates both *U.S.P.* and *P.G.* employ equal volumes of Phosphoric and Sulphuric Acids, the former using a crystal of Ferrous Sulphate, the latter a Solution of Ferrous Sulphate. In testing for Phosphates *U.S.P.* employs a mixture of three parts of Alcohol (94·9 p.c.) and one of Ether, whilst *P.G.* uses Alcohol (90 p.c.) alone. No such test appears in the *B.P.* A test for the absence of Silica is included in the *B.P.*, but not in *U.S.P.* or *P.G.*

The *B.P.* employs Mercuric Chloride Test-solution as a reagent for the detection of Phosphorous Acid; the *U.S.P.* both Mercuric Chloride Test-solution and Silver Nitrate Solution; the *P.G.* Solution of Silver Nitrate and gentle warming. When made alkaline with Ammonia Solution it should not give (even after long standing) a crystalline precipitate of Ammonio-magnesium Phosphate, indicating absence of Magnesium, which is present to a considerable extent in some commercial samples.

The acid when diluted with Water should yield no precipitate when allowed to remain at rest for some time, indicating the absence of Silica.

Mercuric Chloride.—The *B.P.* requires that, if the Acid be diluted, mixed with an equal volume of Mercuric Chloride Solution and heated, no precipitate should form; the *U.S.P.* gives 1 c.c. of Acid diluted with 5 c.c. of Water, but no specified quantity of reagent; a similar dilution when gently warmed and with the addition of a few drops of Silver Nitrate T.S. should not be blackened, indicating the absence of Phosphorous Acid.

Silver Nitrate Solution. Phosphoric Acid (diluted with 5 volumes of Water, *U.S.P.*) should yield no precipitate with Silver Nitrate T.S., indicating the absence of Chlorides, *P.G.* and *U.S.P.* (not even on warming, indicating the absence of Phosphorous Acid, *P.G.*).

Barium Chloride or Nitrate Solution. A diluted Acid (1-4, *P.G.*) should be unaffected by Barium Nitrate Solution, *P.G.*, indicating the absence of Sulphates.

0·1 c.c. of the Acid diluted with Water to 7 c.c. should not afford a cloudiness or precipitate within 30 seconds on the addition of 1 c.c. of Barium Chloride Test-solution, *U.S.P.*

Ammonium Oxalate Solution.—A 1-4 aqueous dilution of the Acid, after the addition of excess of Ammonia Solution should not be changed by the addition of Ammonium Oxalate Solution, indicating the absence of Calcium, *P.G.*

Hydrogen Sulphide.—The Acid should not be affected by Hydrogen Sulphide Solution, *P.G.*, and 10 c.c. of a 1-20 dilution should not respond to the time-limit test for heavy metals.

Modified Gutzeit's Test.—5 c.c. of a 1-10 aqueous dilution should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Stannous Chloride Solution.—The *P.G.* requires that a mixture, 1 c.c. of Phosphoric Acid with 3 c.c. Stannous Chloride Solution, should not assume a dark colour in the course of an hour, *P.G.*

Alcohol or Alcohol and Ether.—In a mixture of 1 c.c. Phosphoric Acid, 3 c.c. Alcohol (94·9 p.c.) and 1 c.c. Ether there should be no turbidity (absence of Phosphates), *U.S.P.* The *P.G.* directs that a mixture of the Acid with 4 volumes of Alcohol (90 p.c.) should remain clear.

Ferrous Sulphate.—The *U.S.P.* requires that no brown or brownish-black colour should appear around a crystal of Ferrous Sulphate dropped into a cooled mixture of 1 c.c. Phosphoric Acid and 1 c.c. Sulphuric Acid. No coloured zone should be formed when 1 c.c. Ferrous Sulphate Solution is poured as a layer on a mixture of 2 c.c. Phosphoric Acid and 2 c.c. Sulphuric Acid, *P.G.*

Volumetric Determination.—If 10 grammes of Phosphoric Acid be diluted with Water to measure 100 c.c., then 9·73 c.c. of this, diluted with 10 c.c. of cold saturated aqueous solution containing 5 grammes of Sodium Chloride, should require 17 c.c. of Normal Volumetric Potassium Hydroxide Solution for neutralisation (each c.c. corresponding to 5 p.c. of absolute Phosphoric Acid), Phenolphthalein T.S. being used as indicator, *U.S.P.*

Preparation.

ACIDUM PHOSPHORICUM DILUTUM. DILUTED PHOSPHORIC ACID.

A clear colourless liquid possessing an acid taste and strong acid reaction towards blue Litmus paper. It is prepared by diluting 3 of Concentrated Phosphoric Acid with Distilled Water to make 20.

Medicinal Properties.—Tonic and refrigerant, hæmatinic and anhidrotic; diuretic in the phosphatic diathesis. Given with Calcium Phosphate in rickets. Quenches the craving for fluids in diabetes.

Used as a partial substitute for organic acids in cooling drinks and acidulated waters.

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

Prescribing Notes.—*Usually largely diluted with Water, and given with some bitter and aromatic tinctures and syrups; should not be mixed with the Syrup of Iron Pyrophosphate, as the mixture becomes solid.*

Incompatibles.—Lime Water and all alkalis.

Foreign Pharmacopœias.—Official in Norw. and Port., 13·8 p.c.; Russ., 12·5 p.c.; Fr., Jap., Mex., Swed., Swiss and U.S., 10 p.c.

Tests.—It has a specific gravity of 1·08; the *U.S.P.* diluted acid has a specific gravity of 1·057; the *P.G.* does not include a diluted acid. It is officially required to contain 13·8 p.c. w/w of Hydrogen Orthophosphate as gravimetrically determined by converting 1 gramme into a Lead salt by the addition of 0·5 of a gramme of Lead Oxide, heating to a dull redness, cooling and weighing the residue, which should amount to 0·6 gramme; the *U.S.P.* diluted acid is required to contain 10 p.c. w/w of absolute Ortho-phosphoric Acid as determined volumetrically by titration with Normal Volumetric Potassium Hydroxide Solution, using Phenolphthalein Test-solution as an indicator of neutrality. The quantity (4·87 gramme) of the diluted Phosphoric Acid used for the titration is diluted with 5 c.c. of a cold saturated Sodium Chloride Solution. Concentrated Phosphoric Acid answering the official description is used in the preparation of the diluted acid, and it is therefore required to answer the tests and to be free from the impurities given under the Concentrated Acid.

Not Official.

ACIDUM PICRICUM.

$C_6H_2(NO_2)_3OH$, eq. 227·44.

PICRIC ACID. CARBAZOTIC ACID. TRINITROPHENOL.

Pale yellow crystalline scales, prepared by the action of hot Nitric Acid on Phenol-sulphonic Acid.

Picric Acid, Picrates, and Mixtures of Picric Acid when in process of manufacture or when kept, conveyed, imported, or sold for any purpose, come within the Explosives Act 1875, except when it is mixed with not less than half its own weight of Water. For the dealer in these substances there are special conditions as to storing, etc.

With Ammonia, Potassium Hydroxide and Sodium Hydroxide it forms crystalline salts, which are explosive.

Solubility.—1 in 90 of Water; 1 in 10 of Alcohol (90 p.c.).

Medicinal Properties.—A solution (1 or 2 p.c.) of Picric Acid has been recommended as an application to scalds and burns, and also in acute eczema.—*B.M.J.* '96, ii. 651 and 1826; '97, i. 331 and 457; '99, i. 1152; *L.* '03, ii. 640, 799.

It has also been given in ½ to 1 grain doses as a bitter tonic.

Specially useful as a first dressing in burns; has all the advantages of boric acid, plus that of relieving pain.—*B.M.J.* '07, ii. 524.

Solution for Removal of Picric Acid Stains.—Sodium Benzoate, 1; Boric Acid, 1; Water, 100.

A saturated aqueous solution is a delicate test for the presence of Albumen in fluids; even in very dilute solutions a white cloud is formed at the junction of the two liquids, and in stronger solutions the Albumen is precipitated. Used in histological work.

Foreign Pharmacopœias.—Official in Fr., Jap. and Mex. Not in the others.

Tests.—The pure Acid melts at 122° C. (241·6° F.). At a higher temperature it partially sublimes, and boils, giving off bitter yellow suffocating vapours. It may be determined by titration with Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality; 1 gramme of the Acid should require about 4·4 c.c. of the Volumetric Solution. A dark red liquid is produced when a solution of Picric Acid is boiled with a strong Solution of Potassium Cyanide. When boiled with a strong Solution of Calcium Hypochlorite it gives off pungent, tear-producing vapours. It should be free from mineral impurities, and from more than traces of Sulphates.

AMMONII PICRAS.—Yellow, odourless, glistening crystalline needles. Soluble 1 in 93 of Water, 1 in 82 of Alcohol (90 p.c.). Given as a substitute for Quinine, also in exophthalmic goitre and malaria.

Dose.—¼ to 1 grain = 0·016 to 0·06.

Not Official.

ACIDUM PYROGALLICUM.

PYROGALLIC ACID. PYROGALLOL.

$C_6H_3(OH)_3$, eq. 125·10.

FR., PYROGALLOL; GER., PYROGALLOL; ITAL., PIROGALLOLO.

Light, white crystalline tufts, which have a tendency to become coloured on exposure to strong light, more particularly in solution. The change is more rapid in alkaline solution. Usually prepared by heating Gallic Acid to 185° to 200° C. (365° to 392° F.).

It should be kept in well-closed, dark amber-tinted glass bottles as far as possible from the light.

Solubility.—1 in 2 of Water, and measures 2½; 9 in 10 of Alcohol (90 p.c.).

Medicinal Properties. — Escharotic, antiseptic, and disinfectant. Its use requires care.

Not more than 15 to 25 grains should be used in the twenty-four hours, as violent toxic symptoms may result from its absorption.—*T.G.* '85, 59.

Used in the form of a 10 p.c. **salve**, and applied with a brush twice a day, it proved very useful in Hebra's wards in the treatment of psoriasis. The parts were then covered with cotton wadding or linen, and when very extensive were covered with flannel.—*Pr.* xxv. 377.

An **ointment**, Pyrogallic Acid 40, Starch 40, Vaseline 120, also a **powder**, Pyrogallic Acid 20, Starch 80, have been used for venereal ulcers.—*L.M.R.* '82, 228; '84, 68.

Mixed with Collodium Flexile, 40 grains to the oz., for psoriasis.—*T.G.* '86, 181.

Largely used in photography. It has also been used for blackening the hair. 1 in 16 of Water is used with a Solution of Silver Nitrate (1 in 30 of Water).

To remove stains of Pyrogallic Acid, rub a little Ammonium Persulphate on the fingers and rinse with Water.—*P.J.* '98, i. 504*a*.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Russ., Swed., Swiss and U.S. Not in Port. or Span.

Tests.—Pyrogallic Acid melts at 131° to 132° C. (267·8° to 269·6° F.), and sublimes at a higher temperature without leaving any mineral residue. Solutions of the acid gradually absorb Oxygen from the air becoming darker in colour, and this absorption is much accelerated in the presence of alkalis, the solutions then rapidly becoming dark brown or almost black. A freshly prepared dilute Solution of Ferrous Sulphate yields an indigo blue coloration with a solution of Pyrogallic Acid, and solutions of Ferric salts a brownish-red coloration; solutions of Mercuric, or Silver salts are rapidly reduced.

UNGUENTUM ACIDI PYROGALLICI (Jarisch's Ointment).—Pyrogallic Acid, 60 grains; Lard, 1 oz.

This has been incorporated in the *B.P.C.* as follows:—

Pyrogallic Acid, 12; Lard, 88.

UNGUENTUM PYROGALLOL COMPOSITUM.—Pyrogallic Acid, 30 to 60 grains; Ichthyol, 30 grains; Salicylic Acid, 15 grains; Soft Paraffin, to 1 oz.—*Middlesex.*

Pyrogallol, 20 grains; Ammonium Sulpho-ichthyolate, 20 grains; Salicylic Acid in powder, 8 grains; Soft Paraffin to 1 oz.—*London.*

Unguentum Pyrogalloli Compositum (*Unna*).—Pyrogallic Acid, 5; Salicylic Acid, 2; Ammonium Ichthyosulphonate, 5; Yellow Vaseline, 88.—*Hager*, and *Pharm. Form.*

This has been incorporated in the *B.P.C.* under the title Unguentum **Acidi Pyrogallici Compositum** *syn.* Unna's Compound Pyrogallol Ointment, employing Soft Paraffin.

Unguentum Pyrogallol Oxydati.—Oxidised Pyrogallic Acid, 5; Salicylic Acid, 5; Hydrous Wool Fat, *q.s.* to make 100.—*B.P.C.*

UNNA'S PYROGALLIC PLASTER MULL.—Contains 40 p.c. of the Acid, equal to ½ grain in each square inch of surface.

ACID PYROGALLIC OXIDISED (Pyraloxin).

Some attention has been directed to this drug by its recent employment in dermatological practice. It is a brownish-black powder readily soluble in Water, prepared by oxidising Ammonium Pyrogallate in a current of air. It possesses no toxic properties, nor is it liable, as a rule, to excite any dermatitis. It has been employed (*Edin. Med. Jour.* '05, 437) in the treatment of lupus erythematosus.

In the treatment of psoriasis it stands next to Chrysarobin in efficiency. It is unsuited for the acute or rapidly extending phase, but when the disease has come to a standstill, or is showing distinct evidences of retrogression, its advantages are said to be incontestable. It may be applied as an **ointment** (½ drm. to the oz.), made up with Vaseline, or with the addition of 10 grains of Salicylic Acid as a mordant. A cleaner method is to employ 10 parts dissolved in 20 of Benzol and 80 of Acetone.

In lupus erythematosus applied as an **ointment**: Zinc Oxide, 10; Kaolin, or terra silicia, 2; Oxidised Pyrogallic Acid, 5; Vaseline, 28.

In infantile eczema of the face the most brilliant results have been obtained. It is applied to the reddened and irritable surface of the skin in the form of a thin coating of Lassar's Paste, to which 10 grains of Pyraloxin have been added.

For the eradication of ringworm of the scalp in children it is applied in the form of an **ointment**: Oxidised Pyrogallic Acid, 10 grains; Precipitated Sulphur, ½ drm.; Ammoniated Mercury, 15 grains; and Vaseline, 1 oz.

Eugallol (Pyrogallol mono-acetate), a brownish-yellow thick syrupy liquid; **Gallacetophenone**, a yellowish-brown powder; **Lenigallol** (Pyrogallol triacetate), a white powder; and **Saligallol** (Pyrogallol di-salicylate), a resinous solid, are preparations which have received attention in the treatment of skin diseases.

ACIDUM SALICYLICUM.

SALICYLIC ACID.

$HC_7H_5O_3$, eq. 137·01.

FR., ACIDE SALICYLIQUE; GER., SALICYLSAURE; ITAL., ACIDO SALICILICO; SPAN., ACIDO SALICILICO.

Colourless, odourless, prismatic crystals when prepared synthetically from Carbolic Acid, but the Acid derived from the Oil of Wintergreen or of Sweet Birch, commonly called 'natural acid,' is usually supplied in large crystals possessing a yellowish or pinkish tint, and generally possesses a faint odour of Methyl Salicylate.

It may also occur as a light, white crystalline powder. It possesses at first a sweetish and subsequently an acrid taste.

Prepared by passing Carbonic Acid Gas into a mixture of Carbolic Acid and Sodium Hydroxide at a high temperature, and decomposing the Sodium Salicylate with a mineral Acid, and subsequent purification; or by treating Oil of Wintergreen (*Gaultheria procumbens*), which is mainly composed of Methyl Salicylate, also Oil of Sweet Birch (*Betula lenta*) and *Andromeda leschenaultii* (a native of India), with a Solution of Potassium Hydroxide, and distilling it, decomposing the residue with Hydrochloric Acid, and purifying the Salicylic Acid by recrystallisation.

Salicylic may be sublimed, but there is almost certain to be some slight decomposition with liberation of Phenol.

Solubility.—About 1 in 550 of Water; 1 in 9 of boiling Water; 1 in 3½ of Alcohol (90 p.c.); 1 in 11 of Alcohol (60 p.c.); 1 in 35 of Alcohol (45 p.c.); 1 in 2 of Ether; 1 in 55 of Chloroform; 1 in 120 of Olive Oil; 1 in 195 of Glycerin; 1 in 8 of Lard (at 180° F.). 20 grains Salicylic Acid are rendered soluble in a fl. oz. of Water by the addition of 25 grains of Borax or 40 grains of Potassium Citrate; but it is better to use Sodium Salicylate.

Medicinal Properties.—Antiseptic and powerfully antipyretic; specific in acute rheumatism.

A good **preservative** of medicated solutions, such as Cocaine salts and Boric Acid, which are otherwise liable to fungoid growths; 1 in 1000 is sufficient for the purpose, but in the eye causes temporary smarting.

Used as a **lotion** (4 p.c.) in pruritus and urticaria, and some forms of eczema; as an **injection** (1 in 300) in the dysenteric diarrhœa of children; as an **ointment** (1 in 6) for pruritus (*Ringer*). With Zinc Oxide and Starch it is used as a '**dusting powder**' for infants.

In **collodion** form it is very useful when applied to hard and soft corns and warts. It softens and removes them.

The collodion is recommended in lupus.—*Pr.* lii. 96.

The injection of Salicylic Acid in uterine cancer, recommended as a palliative method when the disease is too far advanced to admit of surgical extirpation.—*P.J.* (3) xxv. 1219.

A solution in spirit, increased 1 p.c. daily from 1 to 6 p.c., applied to remove the stumps left after removal of papillomatous growths. It also forms a useful application dissolved in Sodium Sulpho-ricinate solution.—*B.M.J.* '04, ii. 1221, 1224.

A daily application of a 10 p.c. solution of Salicylic Acid in Sulpho-ricinate of Soda for pharyngo-mycosis. This salt of soda seems to be the vehicle with which Salicylic Acid can be incorporated so as to be as unirritating as possible.—*B.M.J.* '07, i. 1155; *L.* '07, i. 1248.

Recommendation of the Departmental Committee appointed to inquire into the use of preservatives and colouring matters in food. Salicylic Acid be not used in greater proportions than 1 grain per pint in liquid food; and 1 grain per lb. in solid food, its presence in all cases to be declared.—*L.* '01, ii. 1683; *J.S.C.I.* '01, 1228; *P.J.* '01, ii. 620; *C.D.* '01, ii. 880; *Analyst*, '01, 332.

Salicylic Acid as a preservative for foods has been stated to be injurious, for three reasons: (1) That it is antiseptic and antifermentative, and therefore liable to interfere with the digestive processes; (2) after absorption is apt to injure the general health; (3) that it is an irritant and apt to injure the mucous membrane of stomach and intestinal canal; but the results of experiments by Macalister and Bradshaw are opposed to these conclusions, and they contend that there is no justification for them.—*L.* '02, ii. 1544; '03, i. 717.

Prescribing Notes.—*On account of its slight solubility in Water, it is usually given internally in the form of Sodium Salicylate, which is readily soluble, and is less irritating to the mucous membrane. It is also given in combination with Bismuth and Lithium.*

Dose.—5 to 20 grains = 0·32 to 1·3 grammes.

Incompatibles.—Spirit of Nitrous Ether, Iron salts.

Official Preparations.—Sodii Salicylas, Unguentum Acidi Salicylic . Used in the preparation of Injectio Cocainæ Hypodermica, Liquor Atropinæ Sulphatis, and Salol. *See* also Bismuthi Salicylas.

Not Official.—Collemplastrum Salicylatum, Collodium Salicylicum, Collodium Lacto-salicylicum, Collodium Callosum, Salicylic dressings, Glycerinum Acidi Salicylici, Lotio Acidi Salicylici Co., Parogen Salicylatum, Pulvis Salicylicus cum Talco, Pulvis Talci Salicylicus, Salicylic and Creosote Plaster Mulls, Salicylic Acid Suet, Unguentum Acidi Salicylici, Vasolimentum Salicylicum, Salacetol, Aspirin, Acetylsalicylic Acid, Agathin, Glycosal, and Salitannal.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Jap., Ital., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—Salicylic Acid melts at 156° to 157° C. (312·8° to 314·6° F.); the *U.S.P.* states it begins to melt at 156° C. (312° F.) and is completely melted at 157° C. (314·6° F.); the *P.G.* that it melts at about 157° C. (314·6° F.). According to the *U.S.P.* it is gradually dissipated at a higher temperature than 157° C. (314·6° F.). The distinctive test is the violet colour imparted to an aqueous solution by Ferric Chloride Test-solution, and the production of the peculiar odour of Methyl Salicylate when a little of the Acid is warmed with Methyl Alcohol and strong Sulphuric Acid. The latter test is included in *U.S.P.* but not in *B.P.* or *P.G.* The Acid is not officially required in this instance to 'afford when neutralised the reactions characteristic of Salicylates.' According to the *B.P.* the acid volatilises at 200 C. (392° F.) 'without decomposition,' but unless the Acid is very carefully heated there is almost certain to be some slight decomposition, with liberation of Phenol, which fact is noted in *P.G.* The Acid may be readily determined by titration with Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. Each gramme of the Acid should require about 7·3 c.c. of the Volumetric Solution, indicating 100·0 p.c. of absolute Salicylic Acid. Neither the *B.P.* nor *P.G.* includes a volumetric method of determination.

The more generally occurring impurities are unconverted Phenol, isomers, or homologues of Salicylic Acid, organic impurities, Hydrochloric Acid, Carbolates or Sulphocarbolates, and mineral residue. The test for Phenol, viz., its extraction from alkaline solution with Ether, is practically the same in the *B.P.*, *U.S.P.*, and *P.G.*, the latter Pharmacopœia giving the relative quantities to be used in performing the test. The method adopted by each Pharmacopœia is compared in the small type below, under the heading of Ether. Isomers or homologues of Salicylic Acid are detected by their influence on the melting point and by the evaporation test. The *B.P.* evaporates an aqueous solution, whilst *P.G.* and *U.S.P.* employ an alcoholic one. The test is more severe when water is employed with excess of the sample, for as pointed out (*P.J.* (3) xxi. 478), the impurities are more soluble in this fluid than the Acid, it therefore tends to magnify the proportion of impurity on solution, and to separate it on evaporation. A filtered saturated aqueous solution prepared by shaking the acid with a small quantity of Water, when evaporated to dryness is officially required to leave a white residue free from any buff coloured fringe, which according to the *B.P.* indicates the absence of Iron, organic impurities and colouring matter. Concentrated Sulphuric Acid serves to detect organic impurities; the *B.P.* requiring no colour to be developed in 15 minutes, but making no reference to the relative proportions of the two acids, the *U.S.P.* and *P.G.* giving the latter but no time limit; the *U.S.P.* employs about 0·5 of a gramme of Salicylic Acid in 10 c.c. of Sulphuric Acid; the *P.G.* requires one part of Salicylic Acid should be dissolved by 6 parts of Sulphuric Acid without coloration. A test for Chlorides is included in *U.S.P.* and *P.G.* The *U.S.P.* allows not more than 0·6 p.c. and the *P.G.* no weighable residue; the *B.P.* makes no mention of mineral residue.

The test distinguishing Salicylic Acid from Carbolates and Sulpho-carbolates by means of Solution of Uranium Nitrate is peculiar to the *B.P.*; but this reaction would not detect the presence of either of the latter in a sample of Salicylic Acid. It depends upon the assumption that Uranium Nitrate Solution produces a yellowish-brown precipitate in solutions of the acid not weaker than 1 p.c., whereas solutions of Carbolates and Sulpho-carbolates are not precipitated.

Evaporation.—In the *P.G.* and *U.S.P.* an alcoholic solution of the Acid (1–10, *P.G.*; saturated, *U.S.P.*) is allowed to evaporate spontaneously in a place protected from dust, when a perfectly white residue should remain.

Ether.—If 1 gramme of Salicylic Acid be dissolved in excess of cold Sodium Carbonate Solution and the liquid agitated with an equal volume of Ether, and the ethereal solution be allowed to evaporate spontaneously, the residue, if any, should be free from the odour of Phenol, *B.P.* and *U.S.P.* The *P.G.* test gives as quantities 0·5 gramme of Acid dissolved in 10 c.c. of a 1–10 Sodium Carbonate Solution.

Silver Nitrate.—The *P.G.* and *U.S.P.* require that an alcoholic Solution of Salicylic Acid (1–10, *P.G.*; 1–20, *U.S.P.*) should be unaffected by Silver Nitrate T.S. after the addition of a few drops of Nitric Acid, indicating the absence of Chlorides.

Preparation.

UNGUENTUM ACIDI SALICYLICI. Salicylic Acid Ointment.

Salicylic Acid, 1; White Paraffin Ointment, 49.

Foreign Pharmacopœias.—Official in Mex. (Pomada de Acido Salicilico), Acid 1, Alcohol 2, Vaseline 9; Austr., Sebum Salicylatum (*see* below). Not in the others.

SODIUM SALICYLATE. *See* SODII SALICYLAS.

Not Official.

COLLEMPLASTRUM SALICYLATUM (*Austr.*). — Collemplastrum adhesivum mass, 100; Acid Salicylic, 4; Petroleum Ether, 20.

COLLEMPLASTRUM ADHÆSIVUM (*Austr.*).—Resin Oil, 6; purified sliced India-rubber, 10; Petroleum Ether, 45; allow to stand with frequent agitation until dissolved; add Balsam Copaiba and Colophony Resin, of each, 4; Adeps Lanæ, Cera Flava and Sandarach, of each, 2; powdered Orris Root, 9; and Ether, 16.

COLLODIUM SALICYLICUM.—Salicylic Acid, 60 grains; Flexile Collodion, 1 oz.—*Guy's* and other Hospital Pharmacopœias.

Salicylic Acid, 12; Acetone Collodion, *q.s.* to produce 100.—*B.P.C.*

The *B.P.C. Supplement* now dissolves the Acid in 30 of Acetone before making up to 100 with the Collodion.

Salicylic Acid, 1; Flexile Collodion (by weight), 9.—*Fr.*

COLLODIUM CUM ACIDO SALICYLICO.—Salicylic Acid, 20; Spirit of Ether, 20; Collodium, 60.—*Dutch.*

COLLODIUM SALICYLICUM COMPOSITUM.—Salicylic Acid, 60 grains; Extract of Indian Hemp, 10 grains; Flexile Collodion, to 1 oz.

Collodium Salicylicum Compositum. *Syn.* COLLODIUM CALLOSUM.—Salicylic Acid, 12; Extract of Indian Hemp, 2; Acetone Collodion, *q.s.* to produce 100.—*B.P.C.*

The *B.P.C. Supplement* now dissolves the Acid and Extract in 30 of Acetone before making up to 100 with the Collodion.

COLLODIUM LACTO-SALICYLICUM.—Salicylic Acid, 60 grains; Lactic Acid, 1 fl. drm.; Flexile Collodion, to 1 fl. oz.

COLLODIUM SALICYLICUM CUM ZINCI CHLORIDO.—Salicylic Acid, 60 grains; Zinc Chloride, 30 grains; Flexile Collodion, 1 oz.—*Guy's.*

SALICYLIC DRESSINGS.—**Gauze, Lint,** and **Wool,** 4 p.c.; **Jute,** 4 and 10 p.c. Jap. has Cotton 5 p.c. and Gauze.

GLYCERINUM ACIDI SALICYLICI.—Salicylic Acid, 1 part; Glycerin, 9 parts. Also called Pasta Acidi Salicylici.

LOTIO ACIDI SALICYLICI CUM BORACE.—Salicylic Acid, 120 grains; Borax, 60 grains; Glycerin, 1 oz.; Rectified Spirit, 1 oz.; Distilled Water, to 10 oz.—*Middlesex.*

PULVIS SALICYLICUS CUM TALCO (*Dan.*, *Dutch*, *Ger.*, *Jap.*, *Norw.* and *Swed.*).—Salicylic Acid, 3; Wheat Starch, 10; Talc, 87; mix to a fine powder.

Pulvis pro pedibus (*Swiss*).—Same formula as above. Used in the German Army as a preventive against perspiring and sore feet. It is applied dry, on a march daily, or in garrison every two or three days.

Pulvis Talci Salicylicus.—Salicylic Acid, 3; Boric Acid, 10; Talc in fine powder, 87.—*U.S.N.F.*

This has been incorporated in the *B.P.C.* under the title **Pulvis Acidi Salicylici Compositus.**

SALICYLIC AND CREOSOTE PLASTER MULLS (*Unna*).—Contain ½ grain of Salicylic Acid and 1 grain of Creosote to the square inch; also twice this strength. Possess a solvent power on horny epidermis, the Creosote acting as an anæsthetic. Also used in the treatment of lupus.—*L.* '86, ii. 574; *B.M.J.* '87, ii. 451.

Salicylic Acid and Creosote can also be applied as an **ointment** with Lard and Wax.

SEBUM SALICYLATUM.—Salicylic Acid, 2; Benzoin, 10; Mutton Fat, 98.—*Austr.*

Used in the German Army for sweaty feet and soreness from riding.

Salicylic Acid, 2; Benzoic Acid, 1; Prepared Suet, 97.—*Ger.*

The German formula appears in the *B.P.C.* as **Sevum Salicylatum.**

UNGUENTUM ACIDI SALICYLICI.—Salicylic Acid, 30 grains; Benzoated Lard, 1 oz.; melt over a water-bath, and stir till cold.

Used for eczema, psoriasis, ringworm, and for foul ulcers.

VASOLIMENTUM SALICYLICUM.—Salicylic Acid, 2; Liquid Vasoliment, 98.—*Hager.*

Parogen Salicylatum. *Syn.* SALICYLATED VASOLIMENT. Salicylic Acid, 10; Parogen, *q.s.* to produce 100.—*B.P.C.*

SALACETOL. Is obtained by the action of Monochloro-acetone on Sodium Salicylate. Crystallises in long needles, melting at 71° C. (159·8° F.); soluble 1 in 2200 of Water, 1 in 15 of Alcohol. It is unaffected by dilute acids, but decomposed by weak alkali with liberation of Salicylic Acid. Introduced as an intestinal disinfectant, resembling Salol in its action.—*B.M.J.E.* '96, i. 92; *L.* '96, ii. 1821.

Dose. 15 to 30 grains = 1 to 2 grammes, for adults; 4 to 8 grains = 0·26 to 0·52 gramme for children.

ACETYLSALICYLIC ACID. Aspirin. $C_7H_5O_2$, $C_2H_3O_2$, eq. 178·71.—Minute, white, odourless crystalline needles. Soluble 1 in 400 Water, 1 in 5 of Alcohol (90 p.c.); soluble in Ether.

Dose.—10 to 15 grains = 0·65 to 1 gramme, three times a day.

Antipyretic and antirheumatic:—Given as a substitute for the Salicylates in rheumatism, also in pleurisy, the advantage being that it does not produce gastric irritation nor singing in the ears to the same extent as the Salicylates. Is best prescribed in the form of cachets or wafers.—*B.M.J.E.* '99, ii. 3, 68, 96; '01, i. 92; ii. 56; *L.* '99, ii. 219; *P.J.* '99, ii. 135; '00, ii. 734, 775; '01, i. 665.

In various children's diseases, rheumatic affections, and in whooping-cough. Action slower than Sodium Salicylate, but effect is more prolonged.—*Pr.* lxx. 141; *B.M.J.E.* '02, i. 12.

15 grain doses once or twice daily given with beneficial effects in cases of inoperable carcinoma.—*L.* '03, i. 984.

In chorea, 10 to 15 grains 3 or 4 times a day.—*L.* '03, i. 526.

Acetylsalicylic Acid should not be prescribed with alkalis or Sodium Bicarbonate.—*P.J.* '03, i. 2, 39.

Superiority of Aceto-salicylic Acid in rheumatic fever, in certain cases when a salicylate has had a good trial.—*L.* '07, i. 733.

In diabetes, alkalis (Soda Water, etc.) and Milk should not be taken with, or just after, the Aspirin.—*Pr.* '07, ii. 139.

Is stated (*L.* '05, i. 84) not to possess any advantage over Salicylic Acid and the Salicylates. In some patients dyspeptic symptoms followed its use, in addition to very profuse perspiration.

This drug still continues to be very largely used, and numerous references to its advantages appear in Continental literature. Two cases are recorded (*B.M.J.* '05, ii. 21) in which a dose of 15 grains caused violent palpitation, difficult respiration, a feeling of extreme weakness and gradually approaching unconsciousness with voiding of dark green urine. On continuing with 7½ grain doses good results were obtained. Toxic symptoms following the administration of Aspirin (*B.M.J.* '05, ii. 1692), 100 grains having been taken in all, in 10 grain doses. The acute inflammation of the middle ear attributed to the Aspirin indicates caution in the administration of the drug in any cases complicated with ear trouble. 7½ grains suggested as a sufficiently large dose to begin with. If no unpleasant results occur after taking this amount, it can be then easily increased.

Foreign Pharmacopœias.—Official in Dan., Jap. and Swiss, Acidum Acetyl-Salicylicum.

Tests.—Aspirin melts at 135° C. (275° F.); when warmed with Potassium Hydroxide Solution it is saponified with the formation of Potassium Acetate and Potassium Salicylate. The cooled solution when acidified with diluted Sulphuric Acid yields a crystalline precipitate of Salicylic Acid, which, when removed, carefully washed till free from mineral acid and dried, possesses the melting point and answers the test characteristic of Salicylic Acid. A portion of the filtrate when warmed with concentrated Sulphuric Acid and a little Alcohol (90 p.c.) evolves a characteristic odour of Acetic Ether. A weighed quantity of 0·1 of a gramme of Aspirin treated with 5 c.c. of Alcohol and diluted with 20 c.c. of Water should not be coloured violet on the addition of 1 drop of diluted Ferric Chloride T.S., indicating the absence of free Salicylic Acid. A weighed quantity of 0·5 of a gramme should leave no weighable residue when ignited with free access of air, indicating the absence of mineral residue.

Novaspirin, a new preparation of Aspirin, it is said to produce no unpleasant gastric symptoms. It is not so strong, and therefore can be given for longer periods and in larger doses.—*B.M.J.E.* '07, i. 79.

AGATHIN. A compound of Salicylic Aldehyde with Methyl-phenylhydrazine. Pale greenish crystals, insoluble in Water, soluble in Alcohol (90 p.c.) and Ether. Has been recommended as an analgesic in sciatica, rheumatic and neuralgic affections. *M.A.* '95, 8, 603; *Y.B.T.* '94, 463; unreliable and dangerous.—*B.M.J.* '98, ii. 1055.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

GLYCOSAL (Monosalicylic Acid Glycerin Ester). White crystalline powder, moderately soluble in Water, readily in Alcohol (90 p.c.). Introduced as a substitute for Salicylates. Antiseptic, antirheumatic.

Dose.—5 to 30 grains = 0·32 to 2 grammes.

SALITANNAL.—A condensation product of Salicylic Acid and Gallic Acid. Introduced as an antiseptic application for wounds.

Iodo-Salicylic Acid and **Di-Iodo Salicylic Acid** are Iodine compounds of Salicylic Acid in which one or two atoms of Hydrogen respectively are replaced by Iodine.—*B.M.J.* '97, ii. 734.

ACIDUM SULPHURICUM.

SULPHURIC ACID.

Fr., Acide Sulfurique Officinal; Ger., Schwefelsaure; Ital., Acido Sulforico; Span., Acido Sulfurico.

A heavy, colourless, odourless liquid, of oily consistence, possessing a strong corrosive action. It may be produced by the suitable oxidation of Sulphurous Anhydride, itself a product of the oxidation of Sulphur or of the combustion of pyrites. It is officially required to contain about 98 p.c. by weight of Hydrogen Sulphate, $\mathbf{H_2SO_4}$, eq. 97·34.

A fuming Sulphuric Acid is known under the title of **Nordhausen Sulphuric Acid,** and is prepared by the distillation of dry Ferrous Sulphate.

Under the name of **Solid Sulphuric Acid,** Sulphuric Anhydride has been introduced into commerce.

Medicinal Properties.—A powerful **caustic,** and when so used it is made into a paste with an equal quantity of charcoal. In the form of Nordhausen Sulphuric Acid it has been used in cancer (*see* **Michel's Paste,** p. 83). When **diluted** it is a tonic refrigerant, exciting the appetite and promoting digestion; it is a valuable intestinal astringent, and therefore it is useful in controlling diarrhœa; it diminishes night sweating, more particularly when given with Zinc Sulphate; useful in treating chronic lead poisoning; given with doubtful success in hæmatemesis, hæmaturia and hæmoptysis.

Incompatibles.—Alkalis and their Carbonates, salts of Calcium and Lead.

Official Preparations.—Acidum Sulphuricum Aromaticum, and Acidum Sulphuricum Dilutum. Used in the preparation of Acidum Hydrochloricum, Acidum Nitricum, Acidum Sulphurosum, Æther, Æther Aceticus, Cupri Sulphas, Ferri Sulphas, Liquor Ferri Persulphatis, Magnesii Sulphas, Potassii Sulphas, Sodii Sulphas, Sodii Sulphocarbolas, Spiritus Ætheris Compositus, Spiritus Ætheris Nitrosi, Zinci Sulphas and Zinci Sulphocarbolas. **Aromatic**

Sulphuric Acid is contained in Infusum Cinchonæ Acidum. **Dilute Sulphuric Acid** is contained in Infusum Rosæ Acidum. Used in the preparation of Acidum Hydrocyanicum Dilutum, Antimonium Sulphuratum and Atropinæ Sulphas.

Not Official.—Liquor Acidus Halleri, Mistura Acidi Sulphurici Aromatica, Mynsicht's Elixir of Vitriol, Michel's Paste.

Antidotes.—In case of poisoning by Sulphuric Acid, Magnesia is preferable to Chalk. For other antidotes *see* Hydrochloric and Nitric Acids.

Foreign Pharmacopœias.—Official in all the Pharmacopœias, ranging from sp. gr. 1·835 to 1·845. U.S. sp. gr. not below 1·826 at 25° C. (77° F.). Fr., Ger., Jap., Swed. and Swiss contain also a crude Acid.

Tests.—Sulphuric Acid has a specific gravity of 1·843, the *U.S.P.* states not below 1·826 at 25° C. (77° F.); the *P.G.*, 1·836 to 1·840; neither the *B.P.* nor the *P.G.* gives a boiling point for the acid, the *U.S.P.* states 338° C. (640·4° F.). The distinguishing test is the production of a white precipitate, insoluble in Hydrochloric Acid, when Barium Chloride Solution is added to its diluted or neutralised aqueous solutions. It is officially required to contain 97·82 p.c. w/w of Hydrogen Sulphate as volumetrically determined by suitably diluting with Water and titrating with Volumetric Sodium Hydroxide Solution, each gramme should require 20·1 c.c.; the *U.S.P.* should contain not less than 92·5 p.c., and *P.G.* 94 to 98 p.c. of absolute Acid.

The more generally occurring impurities are Arsenic and Lead, Selenium, Nitrous, Nitric and Sulphurous Acids. Unlike the *U.S.P.* and *P.G.*, the *B.P.* indicates no special test for either Arsenic or Lead, but is content to group these two important impurities with others of considerably less importance under the elastic expression 'it should yield no characteristic reaction,' etc. The *U.S.P.* employs the modified Gutzeit's test for Arsenic, whilst the *P.G.* employs the Bettendorf's test with Stannous Chloride Solution; both are given in the small type below. A standard of 5 parts per 1,000,000 for Arsenic by weight and 20 parts per 1,000,000 for Lead has been suggested.—*C.D.* '08, i. 795. *U.S.P.*, in their test for Lead, have adopted a time limit within which no precipitation shall occur when the Acid is carefully mixed with 4 or 5 volumes of Alcohol (94·9 p.c.). It is required to leave no appreciable residue on evaporation.

Selenium, Nitrous, Nitric and Sulphurous Acids may be detected by the tests given in the small type below under the headings of Hydrochloric Acid and Sodium Sulphite; Ferrous Sulphate and Sulphuric Acid; Potassium Permanganate Solution.

Ferrous Sulphate and Sulphuric Acid.—If Ferrous Sulphate T.S. be carefully poured as a layer on Sulphuric Acid in a test-tube, there should be no coloured zone at the junction of the liquids, *P.G.* and *U.S.P.*

Sulphuric Acid diluted with 20 volumes of Water should not respond to the following tests: It should yield no precipitate, nor become turbid with T.S. of Silver Nitrate, *P.G.* and *U.S.P.* It should not respond to the time-limit test for heavy metals, *U.S.P.*, and when nearly neutralised with Solution of Ammonia should not be affected by Hydrogen Sulphide Solution, *P.G.* When supersaturated with Ammonia Water, evaporated and ignited, no appreciable fixed residue should be left, *U.S.P.*

Potassium Permanganate Solution.—Sulphuric Acid diluted and cooled, should not, on the addition of Potassium Permanganate Solution, immediately discharge its colour. *P.G.* gives 10 c.c. of Acid diluted with 5 volumes of Water and 3 or 4 drops Potassium Permanganate Solution; *U.S.P.* gives 1 c.c. of Acid, 5 c.c. of Water, and 0·1 c.c. Potassium Permanganate Solution.

Modified Gutzeit's Test.—5 c.c. of a 1–10 dilution of Sulphuric Acid should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Stannous Chloride.—No dark colour should be produced in the course of an hour in a mixture of cooled diluted Sulphuric Acid (1–3) and 3 c.c. Stannous Chloride Solution, *P.G.*

Hydrochloric Acid with Sodium Sulphite.—Let Hydrochloric Acid containing Sodium Sulphite be carefully poured on an equal volume of Sulphuric Acid contained in a test-tube. At the junction of the liquids there should be no red-coloured zone, and on warming no reddish precipitate should be formed, *B.P.*, *P.G.*, and *U.S.P.* (for Selenium); *P.G.* and *U.S.P.* give quantities, viz., 2 c.c. of each Acid and a fragment of Sodium Sulphite is dissolved in the Hydrochloric Acid.

Volumetric Determination.—3 c.c. of Sulphuric Acid are accurately weighed and diluted with 50 c.c. of Water. The solution is then titrated with Normal Volumetric Potassium Hydroxide Solution, using Methyl Orange Test-solution as indicator. The number of c.c. of alkali used is multiplied by 4·8675 and divided by the weight of Acid taken, the quotient representing the percentage of absolute Sulphuric Acid present, *U.S.P.*

Preparations.

ACIDUM SULPHURICUM AROMATICUM. AROMATIC SULPHURIC ACID. *B.P.Syn.*—ELIXIR OF VITRIOL.

Mix gradually 6 of Sulphuric Acid with 59 of Alcohol (90 p.c.); add Tincture of Ginger 20, and Spirit of Cinnamon 1.

Tests.—The specific gravity should be 0·922 to 0·926, and 1 gramme should require 2·84 c.c. of the Volumetric Sodium Hydroxide Solution for neutralisation, indicating the equivalent of 13·8 p.c. w/w of absolute Sulphuric Acid. No reference to an indicator of neutrality is given. The *U.S.P.* requires a specific gravity at 25° C. (77° F.) of about 0·933, and that when suitably titrated with Volumetric Solution of Potassium Hydroxide, with Methyl Orange Test-solution as indicator, it shall not indicate less than 20 p.c. of absolute Sulphuric Acid by weight partly in the form of Ethyl Sulphuric Acid.

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

Sulphovinic Acid stated to occur in Acidum Sulphuricum Aromaticum, its quantity being dependent on age of sample.—*P.J.* '02, ii. 137; *C.D.* '02, ii. 292.

Foreign Pharmacopœias.—Dutch and Jap. (Tinctura Acida Aromatica), Cort. Cinnamoni 5, Rad. Zingib. 5, Acidi Sulphurici 10, Spiritus Diluti 90. Mex. (Acido Sulfurico Aromatico), Sulphuric Acid 10, Tincture of Ginger 5, Tincture of Cinnamon 5, Alcohol 80. U.S. (Acidum Sulphuricum Aromaticum), Sulphuric Acid 111, Tincture of Ginger 50, Oil of Cinnamon 1, Alcohol sufficient to measure 1000; add the Sulphuric Acid gradually and with great caution to 700 of Alcohol and allow it to cool, then add to it the Tincture of Ginger and Oil of Cinnamon, and finally enough Alcohol to make the product measure 1000. Tinctura Aromatica Acida, Norw., Acid Sulph. 1½, Aromatic Tincture 8½; Swed., Acid Sulph. 1, Aromatic Tincture 19. Not in Ger. or Russ.

Tinctura Aromatica (Dan., Norw. and Swed.). Cardamoms, 1; Cloves, 1; Galangal Root, 1; Ginger, 1; Cinnamon, 4; diluted Alcohol, 40.

Ger., Russ. and Swiss contain same ingredients, but have Ginger, 2; Cinnamon, 5; diluted Alcohol, 50.

Austr., Cinnamon, 5; Ginger, 2; Zedoary, 1; Caryophyllus, 1; Cardamom, 1; Alcohol (68 p.c.), 50. It should not yield less than 1·5 p.c. of solid residue.

Jap., Cloves, 2; Cinnamon, 10; Cardamom, 2; Ginger, 5; Dilute Alcohol, 100; extract in the cold for seven days; press, filter, and to the filtrate add Spirit of Lemon, 5.

U.S.N.F. preparation is practically identical with that official in *P.G.*

See also below Liquor Acidus Halleri.

ACIDUM SULPHURICUM DILUTUM. Diluted Sulphuric Acid.

Mix gradually 4 of Sulphuric Acid with 40 of Distilled Water, and when cold add more Distilled Water to make 48½ of Dilute Acid at 60° F.

A clear, colourless liquid, possessing a strong acid reaction.

As great heat is developed in mixing strong Sulphuric Acid and Water, it is always safer to add the Acid to the Water than the Water to the Acid. When Acid 1, Water 1, were mixed the temperature rose to 270° F. (132·2° C.).

12 minims contain about 1 minim of strong Sulphuric Acid.

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

Prescribing Notes.—*Prescribed, much diluted, in mixtures; or in cough linctuses, with Squill, Poppies, and Syrup of Mulberries; also to dissolve Quinine.*

Foreign Pharmacopœias.—Official in Austr., Acid 1, Water 4 76, sp. gr. 1·12; Ital., Acid 1, Water 4, sp. gr. 1·180; Dutch, sp. gr. 1·124; Ger. and Russ., Acid 1, Water 5, sp. gr. 1·110 to 1·114; Dan. and Norw., Acid 1, Water 7, sp. gr. 1·081 to 1·085; Belg., Fr., Hung., Jap., Port. and Span, Acid 1, Water 9; Fr., Swed., Swiss, 10 p.c.; U.S., 10 p.c., sp. gr. about 1·067 at 25° C. (77° F.). All by weight.

Tests.—Diluted Sulphuric Acid is officially required to possess a specific gravity of 1·094, and to contain 13·63 p.c. of Hydrogen Acetate, as officially determined by titration with Volumetric Solution of Sodium Hydroxide; the *U.S.P.* diluted acid is required to have a specific gravity of about 1·067 at 25° C. (77° F.), and to contain not less than 10 p.c. w/w of absolute Sulphuric Acid as determined by titration with Normal Volumetric Potassium Hydroxide Solution, using Methyl Orange Test-solution as an indicator; that of the *P.G.* has a specific gravity of 1·110 to 1·114, and contains from 15·6 to 16·3 p.c. w/w of pure acid.

The diluted Acid should naturally respond to the tests of identity and purity given under 'Acidum Sulphuricum,' but *B.P.* does not say so; the *U.S.P.*, on the other hand, duly notes this.

Not Official.

LIQUOR ACIDUS HALLERI. *Syn.* Acidum Sulphuricum Alcoholisatum, Mistura Sulphurica Acida, Aqua Rabelli, Aqua Rabelii, Agua de Rabel, Eau de Rabel.

Austr., Ger., Hung., Mex., Port., Russ., Span. and Swiss.—Sulphuric Acid, 1; Alcohol (90 p.c.), 3.

Dan., Dilute Sulphuric Acid, 1; Syrup of Raspberries, 9; Distilled Water, 40.

Fr., Sulphuric Acid, 1; Alcohol (95 p.c.), 3; Poppy Petals, 0·04.

Dutch, Ital. and Norw.—Sulphuric Acid, 1; Alcohol, 1.

All by weight.

MISTURA ACIDI SULPHURICI AROMATICA.—Aromatic Sulphuric Acid, 10 minims; Red Mixture, to 1 oz.

MYNSICHT'S ELIXIR OF VITRIOL.—Cinnamon, Ginger and Cloves, of each 3; Calamus Aromaticus, 8; Galangal, 12; Sage, 4; Peppermint, 4; Cubebs, 2; Nutmeg, 2; Aloes Wood, 1; Lemon Peel, 1; Sugar Candy, 32; Alcohol (90 p.c.), by weight, 144; Sulphuric Acid, by weight, 96. Digest for three weeks.

Dose.—5 to 10 minims = 0·3 to 0·6 gramme.

MICHEL'S PASTE.—Nordhausen Sulphuric Acid, 3, by weight; Asbestos, finely powdered, 1. Should be prepared fresh as required.

ACIDUM SULPHUROSUM.

SULPHUROUS ACID.

Fr., Acide Sulfureux; Ger., Schwefligsaure; Ital., Acido Solforoso.

A colourless liquid, with a strong characteristic odour of burning Sulphur, officially required to contain 6·4 p.c. of Hydrogen Sulphite, H_2SO_3, eq. 81·46.

It is prepared by the oxidation of Sulphur or by the reduction of Sulphuric Acid by boiling with Carbon or Copper.

Medicinal Properties.—It is a powerful deoxidising agent, disinfectant and antiseptic. In 1 drm. doses, freely diluted, it is valuable in vomiting depending on fermentation in the stomach; and as an intestinal antiseptic in enteric fever. Diluted with 1 or 2 parts of Water, it is used as a **spray** in diphtheria and follicular tonsillitis; mixed with equal parts of Glycerin, as an **application** in erysipelas, ringworm, and other parasitic skin diseases; also for chapped hands and chilblains; very effectual in chapped nipples; as a **lotion,** 1 or 2 drm. to 1 oz. of Water, for wounds, cuts, ulcers, and bed-sores; as an **inhalation** in nasal catarrh and influenza, 60 minims in 20 oz. of Water at 60° to 100° F.

Pfeiffer found that 0·5 to 1 p.c. aqueous solution caused excessive and extensive gastritis. Even 20 minims largely diluted caused irritation of the digestive organs (*A.J.P.* '90, 626); Brunton, however, strongly recommends 1 drm. doses thoroughly diluted, in gastric fermentation; 20 to 30 minims every two or three hours, stated (*B.M.J.* '04, ii. 1450) to check fermentative changes in the bowel in enteric fever.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Port., Soluto de Gaz Sulfuroso; U.S., 6·0 p.c., SO_2.

Tests.—Sulphurous Acid has a specific gravity of 1·025; the *U.S.P.* gives not less than 1·028 at 25° C. (77° F.); it is not official in the *P.G.* The distinguishing tests are its strong sulphurous odour, its power of decolorising Iodine Solution (which is utilised in its quantitative determination), the production of Hydrogen Sulphide when reduced by Hydrochloric Acid and Zinc, and its bleaching action on certain vegetable colouring matters.

It is officially required to contain 6·4 p.c. of Hydrogen Sulphite, as determined by titration with Volumetric Solution of Iodine, using Starch Mucilage as an indicator.

The most likely impurities are an undue amount of Sulphate due to oxidation on keeping and the presence of other Sulphur compounds, notably Hydrogen Sulphide and mineral residue. The presence of Sulphate is guarded against by tests with Barium Chloride Solution, and the mineral residue by the fact that it is required to leave no residue on evaporation.

Mercurous Nitrate Solution.—The gas, evolved on gently heating a few c.c. of the Acid in a test-tube, blackens a strip of paper moistened with T.S. of Mercurous Nitrate, *U.S.P.*

Lead Acetate Solution.—The gas, evolved on gently heating a few c.c. of the Acid in a test-tube, does not affect a strip of paper moistened with T.S. of Lead Acetate, *U.S.P.*

Barium Chloride Solution.—It is officially required to yield only a slight precipitate with Barium Chloride Solution, but if the Sulphurous Acid be oxidised by the cautious addition of Chlorine Solution it yields on the addition of Barium Chloride Solution a copious white precipitate. The *U.S.P.* test gives quantities, 1 c.c. Sulphurous Acid diluted with 99 c.c. of Water, 1 c.c. diluted Hydrochloric Acid, and then 1 c.c. Barium Chloride T.S. yielding not more than a slight turbidity at once.

Volumetric Determination.—1 gramme of the Acid diluted with about 100 c.c. of Water requires 15·7 c.c. of Volumetric Iodine Solution, *B.P.* 2 c.c. of the Acid are accurately weighed in a stoppered weighing bottle. To this are added 50 c.c. of Deci-normal Volumetric Iodine Solution, and the mixture is allowed to stand for 5 minutes. Tenth-normal Volumetric Sodium Thiosulphate Solution is now slowly added until the mixture is just decolorised. Subtract the number of c.c. of the Tenth-normal Volumetric Sodium Thiosulphate Solution used from 50, and multiply the difference by 0·318, and divide this product by the weight of the Acid taken; the quotient represents the percentage of absolute Sulphurous Acid in the latter, *U.S.P.*

Not Official.

SULPHUR DIOXIDE LIQUEFIED.—This is also commonly known as **Liquefied Sulphurous Acid Gas.** It is supplied in syphons, and in tinned iron vessels with soft lead exit-tube.

Disinfecting with Sulphur.—This is usually done with liquid Sulphur Dioxide. The room to be disinfected should be sealed up so as to prevent any ventilation, by blocking up the fireplace and pasting paper over the cracks of the windows. The small leaden exit-tube of the vessel is cut in the room, so as to allow the gas to escape somewhat slowly, and the operator retires quickly, shuts the door and papers up the cracks of the door so as to complete the sealing of the room. The room is allowed to remain closed for 12 hours, and then opened cautiously. About 20 oz. gas is required for a room of a size 1700 cubic feet. When the liquefied gas is unobtainable, Sulphur which is sold in the form of Sulphur Candles can be used as a substitute, but the gas is much more effectual.

In order to obtain the maximum disinfecting power of the Sulphur Dioxide it is necessary to introduce moisture, and this may be done by placing open pans of steaming water in the room, or by injecting steam.

ACIDUM TANNICUM.

TANNIC ACID.

B.P.Syn.—TANNIN.

$C_{14}H_{10}O_9$, eq. 319·66.

FR., TANNIN OFFICINAL; GER., GERBSAURE; ITAL., ACIDO TANNICO; SPAN., ACIDO TANICO.

B.P. gives the formula as $C_{14}H_{10}O_9$, $2H_2O$, but the $2H_2O$ is discountenanced by most of the standard works on chemistry.

A pale buff-coloured, micro-crystalline powder, possessing an acid reaction and a characteristic astringent taste. It is obtained from Nut Galls.

Solubility.—10 in 5 of Water; 10 in 6 of Alcohol (90 p.c.); 3 in 1 of Absolute Alcohol; 1 in 3 of Glycerin, or if warmed, 1 in 1; sparingly in Olive Oil; almost insoluble in Benzol, in Chloroform, and in Ether.

These solubilities were made with Tannic Acid which was very soluble, but different samples vary in solubility.

Commercial Tannic Acid frequently contains some proportion of Gallic Acid, which when dissolving in Water is the last portion to go into solution, and which may be detected by the Potassium Cyanide test mentioned under Gallic Acid.

Medicinal Properties.—Styptic and local astringent. 60 grains in 10 oz. of Rose Water are used as a **spray** for relaxed sore throat; the same strength is also used as an **injection** in leucorrhœa and in chronic gonorrhœa with advantage; 3 grains to the oz. is used as a **nasal douche**; 60 grains to the oz. as an **ointment**; the powder has been used as a **snuff** in epistaxis. Internally for gastric and intestinal hæmorrhage acting as a direct styptic. A dose of 1 drm. is often successful in hæmorrhage from gastric ulcer. For **suppositories** and **pessaries**, *see* p. 87. The **glycerin** is used as a **paint** in relaxed throat, and for nasal discharges; also locally as a styptic.

Equal parts of Glycerin of Tannin and Glycerin of Alum form a good application for relaxed throat.

As an injection into nasal polypi.—*L.* '87, i. 543.

Warm Tannin **enemata** were given with success in the cholera at Naples.—*L.* '85, i. 352.

Tannic Acid is no doubt a local styptic by its albumen-coagulating power. But the careful researches of Stockman have demonstrated the futility of using it as a remote astringent.—*B.M.J.* '00, ii. 1070.

A solution, 2 in 10 of spirit, the best application in alveolar pyorrhœa, loose teeth becoming tight, and regaining their power of mastication; also in dental neuralgia, applied to the gums and round the teeth.—*B.M.J.E.* '07, ii. 12.

Dose.—2 to 5 grains = 0·13 to 0·32 gramme.

Prescribing Notes.—*Prescribed in Water, and may be combined with the Ferrous (but not with the Ferric) salts of Iron. Can be given in* **cachets** *or Compressed Tablets.* 4 *grains with* ½ *minim of Glycerin make a nice* **pill.** 60 *grains to* 1 *oz. of Chalk with* 30 *grains of Powdered Soap make an astringent* **dentifrice.**

Incompatibles.—Mineral Acids, Alkalis, Antimony salts, Lead and Silver, Ferric salts, the vegetable alkaloids, and Gelatin.

Official Preparations.—Glycerinum Acidi Tannici, Suppositoria Acidi Tannici, and Trochiscus Acidi Tannici.

Not Official.—Crayons de Tannin, Gargarisma Acidi Tannici, Lotio Acidi Tannici Sulphurosa, Nebula Acidi Tannici, Pessary or Vaginal Suppository, Schuster's Pastilles, Suppositorium Acidi Tannici c. Opio, Supp. Ac. Tann. et Belladonnæ, Supp. Ac. Tann. et Morphinæ, Unguentum Acidi Tannici, Unguentum Acidi Tannici c. Opio, Tannic Wool, Tannalbin, Honthin, Glutanol, Tannigen, Tannoform, Tanocol, and Tannone.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—The distinguishing test for Tannic Acid is its behaviour with Ferric Chloride Test-solution, which yields a bluish-black colour or precipitate. The *U.S.P.* states that a 1 p.c. w/v aqueous solution of Tannic Acid yields on the addition of a small quantity of Calcium Hydroxide Test-solution a pale bluish-white flocculent precipitate which is not dissolved on shaking, and which becomes more copious and of a deeper blue on the addition of a moderate excess of Calcium Hydroxide Test-solution, a large excess imparting a pale pinkish tint.

Tannic Acid may be distinguished from Gallic Acid by its aqueous solution yielding precipitates with solutions of Isinglass, Albumen or alkaloids. The *U.S.P.* states that it may be distinguished by the test with Calcium Hydroxide Test-solution given above, and by the fact that its aqueous solution produces precipitates with most alkaloids and glucosides, and with Test-solutions of Gelatin, Albumen and Starch. The *B.P.* states Tartarated Antimony, but it has been shown that the latter reagent produces a precipitate in Gallic Acid Solutions also; the *U.S.P.* omits reference to Tartarated Antimony.

Mineral acids and certain mineral salts precipitate Tannic Acid from solution, and the filtrates obtained possess no astringency; the *P.G.* states that it is precipitated from its 1 to 5 aqueous solution by the addition of Sulphuric Acid or by Sodium Chloride.

The most likely impurities are Gum or Dextrin, resinous substances and mineral matters. Traces of Gallic Acid may also be present. Both *U.S.P.* and *P.G.* include specific tests for Gum or Dextrin and resinous substances, which are described in the small type below under the heading of Alcohol and Ether, or Alcohol. Gallic Acid may be detected by the Potassium Cyanide test mentioned under Gallic Acid. No appreciable residue should be left on ignition with free access of air. *U.S.P.* requires it to leave not more than 0·2 p.c., and *P.G.* that 0·5 gramme should not leave a weighable residue. Austr. and *P.G.* require that the Acid shall not lose more than 12 p.c. by weight on drying at 100° C. (212° F.), indicating two molecules of Water of crystallisation.

Alcohol and Ether, or Alcohol. A mixture of 2 c.c. of an aqueous solution of the Acid and 2 c.c. of Alcohol (90 p.c.) should remain clear; also on the further addition of 1 c.c. of Ether, *P.G.* The *U.S.P.* dissolves 2 grammes in 10 c.c. of boiling Water, 5 c.c. of which solution when cooled and diluted with 10 c.c. of Alcohol (94·9 p.c.) should produce no turbidity; or (for resinous substances) when diluted with 10 c.c. of Water.

Preparations.

GLYCERINUM ACIDI TANNICI. Glycerin of Tannic Acid.

Tannic Acid, 1; Glycerin, sufficient to produce 5. (1 in 5)

Foreign Pharmacopœias.—Official in Belg., 3 and 17; Port., 1 and 9; U.S., 1 and 4; Fr. and Mex., 1 and 5 of Glycerin of Starch. Not in the others.

SUPPOSITORIA ACIDI TANNICI. Tannic Acid Suppositories.

Contains 3 grains = 0·2 gramme of Tannic Acid in each suppository, mixed with Oil of Theobroma.

TROCHISCUS ACIDI TANNICI. TANNIC ACID LOZENGE.

½ grain Tannic Acid in each, with Fruit Basis.

Dose.—1 to 6 lozenges.

Foreign Pharmacopœias.—Official in Jap., ¾ grain each; U.S., about 1 grain each with Sugar and Orange Flower Water.

Not Official.

CRAYONS DE TANNIN (*Fr.*).—Tannin, 20; Gum Acacia, 1 (both in powder); mix and make into a mass of pilular consistence by means of equal parts Glycerin and Water, then roll into cylinders of the size required.

GARGARISMA ACIDI TANNICI.—Glycerin of Tannic Acid, 1 fl. oz.; Water, to 10 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

Glycerin of Tannic Acid, 1 fl. drm.; Water, to 1 fl. oz.—*Charing Cross, London* and *St. Bartholomew's.*

LOTIO ACIDI TANNICI SULPHUROSA.—Glycerin of Tannic Acid, 1; Sulphurous Acid, 1; Distilled Water, to make 8.—*St. Bartholomew's.*

NEBULA ACIDI TANNICI.—Glycerin of Tannin, 1 fl. drm.; Distilled Water, to 1 fl. oz.—*City of London Chest.*

Glycerin of Tannin, 40 minims; Water, to 1 oz.—*Throat.*

Glycerin of Tannin, 1; Distilled Water, *q.s.* to produce 10.—*B.P.C.*

PESSARY OR VAGINAL SUPPOSITORY.—Tannic Acid, 10 grains Stearin, or Oil of Theobroma, sufficient to make 2 drm.; for one pessary. Used in leucorrhœa.

This has been incorporated in the *B.P.C.*

SCHUSTER'S PASTILLES.—Tannic Acid, 30 grains; Opium, 1 grain; Glycerin, *q.s.* to form suitable cylinders for the male urethra.

SUPPOSITORIUM ACIDI TANNICI C. OPIO.—Tannic Acid, 3 grains; Powdered Opium, 1 grain; Stearin, or Oil of Theobroma, 11 grains.

SUPPOSITORIA ACIDI TANNICI ET BELLADONNÆ.—Tannic Acid, 3 grains; Extract of Belladonna (*B.P.* '85), ½ grain; Oil of Theobroma, to 15 grains.—*St. Bartholomew's.*

SUPPOSITORIA ACIDI TANNICI ET MORPHINÆ.—Tannic Acid, 3 grains; Morphine Hydrochloride, ½ grain; Oil of Theobroma, to 15 grains.—*Westminster.*

UNGUENTUM ACIDI TANNICI.—Tannic Acid, 20; Glycerin, by weight, 20; Ointment, 60.—*U.S.P.*

This has been incorporated in the *B.P.C.*, but the simple ointment of the *U.S.P.* is different from the *B.P.C.*, which resembles *B.P.* 1885.

UNGUENTUM ACIDI TANNICI C. OPIO.—Tannic Acid, 30 grains; Powdered Opium, 30 grains; Lard, 1 oz.

TANNIC WOOL.—Dissolve 2 of Tannic Acid in 60 of Water, and with it thoroughly moisten 8 of Absorbent Cotton-Wool; press so as to remove 30 of the fluid, then dry the Wool in a warm chamber. When dry remove any discoloured portion. This is sold as **Wool for cigarettes.**

TANNALBIN.—A light brown, tasteless powder, insoluble in Water. A combination of Tannic Acid with albumin, which by a special treatment has been so altered that it is insoluble in the gastric juice, ordinary Albumin Tannate being readily soluble.

Tannalbin and Bismuth Subnitrate given early in the morning, as astringents in treatment of catarrhal ulcers of the large intestine.—*B.M.J.E.* '99, i. 59.

It has been introduced as an intestinal astringent.

Adult Dose.—15 grains = 1 gramme, given at intervals of one or two hours.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch and Swed. Not in the others.

Tests.—When shaken with Water and filtered, the filtrate affords with Ferric Chloride Test-solution a bluish-black coloration. When boiled with Water, cooled, and filtered, the filtrate gives a precipitate with Albumin Solution. When shaken with solution of Sodium Hydroxide (15 p.c.) the mixture gelatinises. When further heated to the boiling point, cooled, and supersaturated with Hydrochloric Acid, an odour of Sulphuretted Hydrogen is evolved, and a white precipitate is thrown down.

The Austr. Ph. gives the following test: 1 gramme of Tannalbin digested for 4 hours at 40° C. (125° F.) with 0·1 gramme of Pepsin, 50 c.c. of Water and 1·5 gramme of Dilute Hydrochloric Acid leaves a residue which after washing with 30 c.c. of water and drying at 100° C. (212° F.) shall not weigh more than ½ gramme. The Dutch Ph. requires that it shall not yield more than 1 p.c. of ash.

HONTHIN (Albumin Tannate).—Greenish-brown tasteless odourless powder. Insoluble in water.

Dose.—10 to 30 grains = 0·65 to 2 grammes, three to five times a day for adults; 5 grains = 0·32 gramme, for children.

GLUTANOL.—Combination of Tannic Acid with vegetable fibrin. Similar in action and properties to Tannalbin. Administered in powder form.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

TANNIGEN (Di-acetyl Tannin).—A greyish-white tasteless powder. Practically insoluble in Water, but readily in alkaline solutions. Recommended in diarrhœa, principally of children, but also in that of adults. It passes through the stomach unchanged, but on entering the alkaline intestinal tract it breaks up and acts as an astringent.

Dose.—1 to 3 grains = 0·06 to 0·18 gramme for children, and 5 to 10 grains = 0·32 to 0·65 gramme for adults. Small doses can be mixed with an equal quantity of Milk Sugar, and larger doses for adults can be taken in **cachets.**

Tests.—When shaken with Water and filtered, the filtrate is coloured bluish-black by Ferric Chloride Test-solution. When warmed with Potassium Hydroxide Solution, cooled, mixed with diluted Sulphuric Acid and a little Alcohol (90 p.c.) and warmed, the odour of Acetic Ether is evolved. It should leave not more than 1 p.c. of mineral residue when ignited at a dull red heat.

TANNOFORM (Methyl-Ditannin).—A light, pinkish-brown, odourless and tasteless powder. A condensation product of Tannic Acid and Formic Aldehyde. It is claimed to possess the astringent effects of Tannin with the antiseptic and drying properties of Formaldehyde. Used as an application in skin diseases, and to wounds, either alone or mixed with Starch, or diluted 1 to 4 with French Chalk, as a dusting powder.

As a 10 p.c. ointment in eczema.—*B.M.J.E.* '99, ii. 48; *M.A.* '00, 182.

Rubbed into the chest for night sweats in phthisis.—*B.M.J.E.* '01, ii. 59.

Foreign Pharmacopœias.—Official in Swed. and Swiss.

TANOCOL.—A white or nearly white odourless and tasteless powder, a combination of Gelatin and Tannic Acid. Insoluble in Water. Stated to be useful as an intestinal astringent.

Dose.—10 to 15 grains = 0·65 to 1 gramme, for an adult; 5 grains = 0·32 gramme, for children.—*L.* '03, i. 1039.

TANNONE.—A condensation product of Tannic Acid and Hexamethylenetetramine. A light brown tasteless powder, almost insoluble in Water and weak Acids, and dissolves slowly in weak alkalis.

Dose.—15 grains = 1 gramme for adults; children, 3 to 5 grains = 0·2 to 0·32 gramme.

ACIDUM TARTARICUM.

TARTARIC ACID.

$H_2C_4H_4O_6$, eq. 148·92.

FR., ACIDE TARTRIQUE; GER., WEINSAURE; ITAL., ACIDO TARTARICO; SPAN., ACIDO TARTRICO.

Colourless and odourless, translucent monoclinic prisms, possessing a strongly acid taste.

It is a di-basic acid prepared from Argol or crude Tartar, and is chemically a Di-oxysuccinic or Di-hydroxysuccinic Acid.

Solubility.—10 in 8 of Water, and measures 14; 1 in 2½ of Alcohol (90 p.c.); 1 in 4½ of Glycerin; 1 in 40 of Ether; 1 in 5 of Absolute Alcohol; nearly insoluble in Benzol and Chloroform.

The solubility of this acid in Ether naturally varies with the amount of Water and Alcohol contained in the Ether. The above figure represents the solubility in *B.P.* Ether (sp. gr. 0·735), but the figure for Ether Purus (sp. gr. 0·720) is 1 in 195.

Medicinal Properties.—The same as Citric Acid.

Dose.—5 to 20 grains = 0·32 to 1·3 grammes.

Incompatibles.—Salts of Potassium, Calcium, Mercury and Lead, Alkaline Carbonates, and the vegetable astringents.

Official Preparations.—Used in the preparation of Pulvis Sodæ Tartaratæ Effervescens, Sodii Citro-Tartras Effervescens, and the other granular effervescing preparations.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Jap., Ital., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—The distinguishing test for Tartaric Acid is the formation of a white crystalline precipitate on the addition of Potassium Acetate Solution to its aqueous solution, the precipitate being soluble in Ammonium Chloride Solution or in Sodium Hydroxide Solution; also the mirror test with Silver Nitrate Solution in its neutralised solutions. Its aqueous solution is officially required to be dextro-rotatory. It is officially required to contain 99·0 p.c. of Hydrogen Tartrate, as determined by titration with Volumetric Sodium Hydroxide Solution; 1 gramme when dissolved in Water neutralises 13·3 c.c. of Volumetric Sodium Hydroxide Solution. *U.S.P.* requires it to contain not less than 99·5 p.c. of pure Tartaric Acid; the *P.G.* does not mention a requisite percentage; the *U.S.P.* states that Phenolphthalein Test-solution is to be used as an indicator of neutrality. Tartaric Acid may be distinguished from Citric Acid, and its presence detected in the latter by its power of decolorising a weak solution of Potassium Chromate, upon which Citric Acid has no action (Alcohol and other reducing agents must be absent). The Pusch's test (*P.J.* [3] xv. 693) with Sulphuric Acid at 100° C. (212° F.) which easily detects 1 p.c. of Tartaric Acid in Citric Acid. The Resorcinol Sulphuric test (*C.D.* '91, i. 6) is also a delicate test for Tartaric Acid, but in the presence of a large proportion of Citric Acid the red colour is rather obscure, and in that case it offers no advantage over Pusch's test.

The more generally occurring impurities are Arsenic, Calcium, Copper, Iron and Lead, Oxalates and Sulphates. The most important impurity is Lead.

A standard of 10 parts per 1,000,000 for Lead, and 1 part per 1,000,000 for Arsenic has been proposed (*C.D.* '08, i. 795). Arsenic, Copper, Iron and Lead may be detected, if present, by the Hydrogen Sulphide test; Calcium by the test with Ammonium Oxalate Solution; Oxalates and Sulphates by the tests with Calcium Sulphate Solution and the Barium Chloride or Nitrate test. Each of these tests is given under its respective heading in the small type below.

When ignited with free access of air it should leave not more than 0·05 p.c. of mineral matter. This is the requirement of both the *B.P.* and the *U.S.P.*; the *P.G.* requires that 0·5 of a gramme of the acid should leave no weighable residue. The *B.P.* standard is considered (*C.D.* '08, i. 795) as too severe, and a limit of 0·1 p.c. of ash is suggested.

Melting Point.—135° C. (275° F.), *U.S.P.* When kept at a temperature of 100° C. (212° F.) for some time, the powdered crystals do not suffer a sensible loss of weight, *U.S.P.*; at a temperature above 135° C. (275° F.) the acid chars, emitting an odour resembling that of burning sugar, *P.G.* and *U.S.P.*

Potassium Acetate Solution. — A (1–3) aqueous solution yields with Potassium Acetate Solution a crystalline precipitate, soluble in Ammonium Chloride Solution and in Sodium Hydroxide Solution; the solution in Sodium Hydroxide gelatinises on warming, but becomes fluid again on cooling, *P.G.* The *U.S.P.* Potassium Acetate test is made with a (1–2) aqueous solution and a (1–3) Potassium Acetate solution, and the crystalline precipitate obtained is soluble in solutions of the alkalis and mineral acids, but not in Acetic Acid.

Hydrogen Sulphide.—There should be no darkening in colour within 5 minutes in a solution of 10 grammes of Tartaric Acid in 20 c.c. of Water nearly neutralised with solution of Ammonia and sufficient saturated solution of Hydrogen Sulphide added to produce 100 c.c., *B.P.*

It should not, after the addition of a few drops of Hydrochloric Acid, show any colour when submitted to the time-limit test for heavy metals, omitting the subsequent addition of Ammonia Water, *U.S.P.*

5 grammes dissolved in 10 c.c. of Water, and solution of Ammonia added until only faintly acid, should be unaffected by Hydrogen Sulphide Solution, *P.G.*

Barium Chloride or Barium Nitrate.—A (1–10) aqueous solution of Tartaric Acid should be unaffected by Barium Nitrate Solution, *P.G.*; by Barium Chloride T.S. after acidulation with a few drops Hydrochloric Acid, *U.S.P.*

Ammonium Oxalate.—A (1–10) aqueous solution of the acid should be unaffected by Ammonium Oxalate Solution, *P.G.*; *U.S.P.* allows a faint turbidity in 10 c.c. of a solution (1–10) supersaturated with Ammonia Water on the addition of Ammonium Oxalate T.S.

Calcium Sulphate Solution.—A (1–10) aqueous dilution should be unaffected by Calcium Sulphate T.S. after nearly but not quite neutralising with Solution of Ammonia, *P.G.* and *U.S.P.*

Volumetric Determination.—3·73 grammes should require not less than 49·8 c.c. normal Potassium Hydroxide Volumetric Solution (each c.c. corresponding to 2 p.c. of pure Tartaric Acid), *U.S.P.* Phenolphthalein Test-solution is used as the indicator.

Not Official.

ACONITI FOLIA.

ACONITE LEAVES.

The fresh leaves and flowering tops of *Aconitum Napellus*, L., gathered when about one-third of the flowers are expanded, from plants cultivated in Britain.

This plant and the Extract from the fresh herb were formerly official, but are now omitted.

Foreign Pharmacopœias.—Official in Fr., Mex., Port., Russ. and Span. Not in the others.

Descriptive Notes.—The leaves only of the plant having flowers shaped like a shallow or navicular helmet should be used, since in some districts *Aconitum paniculatum*, Lam., is cultivated for sale on account of giving a smoother and less resinous extract. It differs from *A. Napellus* chiefly in the helmet being twice as deep as broad and in the more branched inflorescence, and as it does not contain Aconitine, and consequently does not produce the characteristic tingling and numbing sensation when chewed, the leaves should not be used in medicine for that drug. The leaves are most active when about one-third of the flowers are expanded.

Aconite leaves are rarely used in the dried state. The lower leaves are long-stalked and have five or seven lobes, each of which is pinnatifid with linear acute segments. The upper leaves have three to five lobes; they are quite smooth, and paler beneath. The leaves are most active before the flowers are fully formed.

For microscopical detail *see Vogl Anat. Atlas Tab.* 16.

The dried leaves imported from Germany should not be used since it is impossible to distinguish the active and inactive leaves when mixed, and unless the flowers are present there can be no certainty as to the species collected.

ACONITI RADIX.

ACONITE ROOT.

FR., TUBERCULE D'ACONIT; GER., EISENHUTKNOLLEN; ITAL., TUBERO DI ACONITO; SPAN., ACONITO.

The root collected in the autumn from *Aconitum Napellus*, L., cultivated in Britain, and dried.

The *U.S.P.* orders 'root collected in autumn, containing not less than 0·5 p.c. of Aconitine'; *P.G.* states 'collected at the end of flowering time and requires it to yield not less than 0·5 p.c. of alkaloid reckoned as Aconitine.' *B.P.*, *U.S.P.* and *Ger.* all specify the root of *Aconitum Napellus*. *B.P.* does not give a standard of alkaloid.

Medicinal Properties.—Anodyne, antiphlogistic, antipyretic, diaphoretic. Externally it relieves the pain of acute and chronic rheumatism, facial neuralgia, and of itching, as in erythema. Given internally it lessens the frequency and tension of the pulse, relieves pain and high temperature, and is thus useful in all acute local inflammations (not advanced), such as those of pneumonia, eruptive fevers, erysipelas, tonsillitis, peritonitis, and painful neuralgic affections; contra-indicated when valvular disease of heart is present, or when fever is prolonged as in typhoid.

Beneficial in lowering blood pressure in acute uræmia.—*B.M.J.* '06, ii. 1450.

It is better given in small doses and very frequently, $\frac{1}{2}$ to 1 minim of Tincture every ten minutes or quarter of an hour for two hours, then hourly.—*Ringer.*

Five minims of Tincture given every three or four hours, increasing the dose to 20 minims, succeeded in curing a case of neuralgia in the face, when every other remedy tried had failed.

Ph. Ger. maximum single dose, 0·1 gramme; maximum daily dose, 0·3 gramme.

Antidotes.—In case of poisoning by Aconite, use emetics, Apomorphine $\frac{1}{10}$ grain, Alcoholic stimulants; Atropine or Belladonna, Digitalis, Amyl Nitrite.

Atropine is antagonistic to the action of Aconitine on the heart.

Official Preparations.—Linimentum Aconiti and Tinctura Aconiti. Used in the preparation of Aconitina.

Not Official.—Extractum Aconiti Radicis Alcoholicum, Chloroformum Aconiti, Linimentum Aconiti et Chloroformi, Linimentum Aconiti Compositum, Pastillus Aconiti, Pigmentum Iodi cum Aconito; Tinctura Aconiti Fortior and Trochisci Aconiti.

Foreign Pharmacopœias.—Official in Belg., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Port., Russ., Span., Swiss and U.S. Not in the others.

Descriptive Notes.—The Aconite root met with in commerce varies considerably in quality and appearance. The root cultivated in Britain is either dried whole or split into two or three longitudinal segments. The latter form enables the soundness of the root to be seen, but the structure is not so easily observed as in the roots dried whole. When collected in autumn the root is solid, brownish externally and white and starchy within; but if collected in summer when in full flower, the old root to which the flowering stem is attached is spongy and porous or hollow, being exhausted by the flowering process; such roots are excluded by the *B.P.* The root dried entire exhibits, when broken across the centre, a seven-angled portion or pith, with a small group of vessels visible at each angle, and well-marked dark cambium line, and is, if carefully dried, white and starchy, but if overheated it has a resinous fracture. It is about $2\frac{1}{2}$ to $3\frac{1}{2}$ in. (62 to 87 mm.) long, and $\frac{5}{8}$ in. to $\frac{7}{8}$ in. (15 to 22 mm.) in diameter at the widest portion. If cautiously applied to the tongue, it should cause a numbing sensation after a short interval; the *Aconitum paniculatum*, Lam., does not do so. The root collected in autumn consists of the new root, and may be recognised by having only leaf scales at the apex, and not any portion of stem. The *B.P.* requires the root to be crowned with the remains of an undeveloped bud, and therefore excludes the German root, which is usually collected when the plant is in flower, and consequently crowned with the base of the stem; it is also collected indiscriminately by peasants from any blue-flowered species, and therefore varies considerably in strength. Japanese root is shorter, grey-brown externally, conical, and tapering abruptly to a point; it is obtained from a different species, stated to be *A. Fischeri*, Reicht.

Tests.—Both *U.S.P.* and *P.G.* require the root to yield a definite content of alkaloid; the *U.S.P.* stipulating that it shall yield not less than 0·5 p.c. of Aconitine; the *P.G.* that it shall contain not less than 0·5 p.c. of alkaloid calculated as Aconitine. The process adopted by the *U.S.P.* is essentially as follows:—A weighed quantity of 10 grammes of the root is treated in an Erlenmeyer flask with 75 c.c. of a mixture of 7 parts of Alcohol (94·9 p.c.) and 3 parts of Water, and shaken at intervals for five hours. The contents of the flask are then transferred to a small glass percolator, and after the liquid has passed through the percolation is continued with more of the above mixture of Alcohol and Water until 150 c.c. of percolate is obtained. The percolate is then evaporated at a temperature not exceeding 60° C. (140° F.), and 5 c.c. Tenth-normal Volumetric Sulphuric Acid Solution and 10 c.c. of Distilled Water added. The liquid is filtered into a separator, the dish and filter being washed with about 40 c.c. of Distilled Water and the washings added to the separator, 25 c.c. of Ether and 2 c.c. Ammonia Solution are added, and the mixture agitated for one minute. The lower stratum is drawn off, the Ether-solution is filtered. The lower stratum is returned to the separator and shaken with 15 c.c. of Ether for one minute, the process of drawing off being repeated. The lower stratum is washed with two further portions of 10 c.c. each of Ether. The combined Ether-solutions are evaporated to dryness, and the residue dissolved in 3 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution, and titrated back with Fiftieth-normal Volumetric Potassium Hydroxide Solution until a violet colour is produced, 5 drops of Cochineal Test-solution being used as an indicator of neutrality.

The process of the *P.G.* is essentially as follows:—A weighed quantity of 12 grammes of root, dried at 212° F. (100° C.), and in a moderately coarse powder, is treated with a mixture of 90 grammes of Ether and 30 grammes of Chloroform; after brisk agitation 10 c.c. of a mixture of 2 parts by weight of Sodium Hydroxide Solution (15 p.c.) and one part by weight of Water is added, and the mixture allowed to stand for three hours, shaking well at frequent intervals. Add 10 c.c., or at any rate sufficient Water to cause the powdered root to agglomerate on shaking and the supernatant liquid to clear completely. After standing for one hour 100 grammes of the clear Chloroform-Ether Solution is filtered through a dry, well-covered filter into a flask and about one-half distilled off. The remaining Chloroform-Ether Solution is introduced into a separator, the flask washed three times with a mixture of 3 parts by weight of Ether and 1 part by weight of Chloroform, and the mixed liquids well shaken with 25 c.c. of Centi-normal Volumetric Hydrochloric Acid Solution. After the addition of sufficient Ether to cause the Chloroform-Ether Solution to float on top of the acid liquid and after the fluids have become completely clear, the acid liquid is filtered through a small filter paper previously moistened with Water, into a flask holding about 100 c.c. The Chloroform-Ether solution is shaken three times in succession with 10 c.c. of Water, passing the washings through the same filter paper; the latter is washed with Water and the mixed fluids diluted with Water to 100 c.c. A measured quantity of 50 c.c. is removed, 50 c.c. of Water and sufficient Ether to form a layer of 1 cm. are added, and after the addition of 5 drops of Iodeosin Solution, Centi-normal Volumetric Potassium Hydroxide Solution is added until the lower aqueous layer assumes a pale red coloration, shaking vigorously after each addition. Not more than 8·5 c.c. of

Centi-normal Potassium Hydroxide Solution should be required to effect this.

Preparations.

LINIMENTUM ACONITI. Liniment of Aconite.

Powdered Aconite Root percolated with Alcohol (90 p.c.) to produce a liquid, of which 30 represents 20 of root and contains 1 of Camphor. (1 in 1½)

This liniment was introduced by Peter Squire, who made it 1 in 1, and it was kept this strength in *B.P.* '64 and '67. It was diluted to 1 in 1½ in *B.P.* '85, but more recent experiments (*P.J.* '03, i. 458) show that it can be made 1 in 1 and practically contain all the alkaloid.

Applied with a camel's-hair pencil, alone, or mixed in equal proportions with Soap Liniment or Ammoniated Camphor Liniment, and rubbed on the part (but not upon an abraded surface), relieves acute neuralgia.

TINCTURA ACONITI. Tincture of Aconite.

Fr., Teinture d'Aconit; Ger., Akonit Tinktur; Ital., Tintura di Aconito; Span., Tintura Alcoholica de Aconito.

1 of Aconite Root, in No. 40 powder, percolated with Alcohol (70 p.c.) to yield 20. (1 in 20)

Dose. 5 to 15 minims = 0·3 to 0·9 c.c.; if very frequently repeated, 2 to 5 minims = 0·1 to 0·3 c.c.

Ph. Ger. maximum single dose, 0·5 gramme; maximum daily dose, 1·5 grammes; of the 1 in 10 Tincture.

Tests.—Tincture of Aconite has a specific gravity of about 0·890, it contains about 1·0 p.c. w/v of total solids and about 70 p.c. w/v of Absolute Alcohol.

Dr. Fleming's Tincture of Aconite (sometimes known as Tinctura Aconiti Fortior) was much stronger, being about the same strength as the present Liniment, 1 in 1½, but without the Camphor. **Dr. Turnbull's Tincture of Aconite** was rather weaker than Fleming's.

Foreign Pharmacopœias.—Official in Mex. and Hung., 1 **Root** and 5. Fr., Alcoolature, 1 fresh **Leaves** and 1; also 1 **Root** in 10. Ger. and Jap., 1 **Root** and 10. Ital., 1 **Root** and 5. Port., 1 dried **Leaves** and 5; also 1 **Root** and 5; and 1 fresh **Leaves** and 1. Span., 1 **Root** in 10. All by weight. U.S., **Root** 10, Alcohol to measure 100. U.S. has also Fluidextractum Aconiti, 1 in 1, standardised to contain 0·4 p.c. w/v of Aconitine.

Dutch, Root percolated with Alcohol (70 p.c.) to produce a tincture containing 0·025 p.c. of alkaloids.

The *Brussels Conference* adopted a standard of 0·05 p.c. of total alkaloids, the tincture being prepared with Alcohol (70 p.c.). Belg., Fr. and Swiss adopt the *Brussels Conference* standard.

Not Official.

EXTRACTUM ACONITI RADICIS ALCOHOLICUM.—Aconite Root in powder, percolated with Alcohol (90 p.c.), and the product evaporated to a pilular consistence.

Dose.—¼ to ½ grain = 0·01 to 0·03 gramme.

This must not be confounded with Extractum Aconiti, *B.P.* '85, which was made from the **herb** and was much weaker.

Foreign Pharmacopœias.—Official in Fr., Hung. and Russ., use 70 p.c., Alcohol; Mex., 60 p.c. Alcohol; Ital., standardised to contain not less than 0·5 p.c. of alkaloid.

CHLOROFORMUM ACONITI.—Powdered Root, 20; Chloroform, to percolate, 20. Painted on with a camel's-hair brush, relieves neuralgia in almost every form. The above formula was that introduced by Peter Squire about fifty years ago. It is preferably prepared by a similar method to that given under Chloroform Belladonna, by mixing the root in No. 40 powder with Slaked Lime and powdered Ammonium Carbonate and percolating with sufficient Chloroform to produce a 1 in 1 percolate. The *B.P.C.* process employs Ammonia Solution, necessitating the use of Absolute Alcohol to allow the Chloroform to exert its full solvent action. Squire's original process yielded a product having a specific gravity of 1·479, and contained 1·09 p.c. w/v of total solids. When assayed according to the process recommended by the *U.S.P.* for the assay of Aconite, it yielded gravimetrically 0·09 p.c. w/v of Aconite alkaloids yielding the same figure on titration; when assayed according to the process recommended by Farr and Wright it yielded a similar figure both gravimetrically and volumetrically. Samples of the preparation prepared by the modified Squire process and by the process of the *B.P.C.* (which consists in moistening 100 of the root in No. 60 powder with 25 of Ammonia Solution, and percolating with a sufficient quantity of a mixture consisting of 1 of Absolute Alcohol to 7 of Chloroform to produce a 1 in 1 product) to some extent confirmed the results published by Farr and Wright (*P.J.* '07, ii. 107), and showed that the former yielded a lower percentage of Aconite alkaloids than the latter. A better idea of the relative efficiency of the two processes is obtained by employing the method adopted by the 8th Decennial Revision of the *U.S.P.* for the assay of Aconite. When assayed by the *U.S.P.* process, a Chloroform of Aconite prepared by the modified Squire process showed on gravimetric determination 0·16 p.c. of Aconite alkaloids, which gave 0·163 p.c. on titration. The *B.P.C.* product assayed by the *U.S.P.* process showed 0·264 p.c. by gravimetric determination and 0·266 p.c. on titration; when assayed by Farr and Wright's process Chloroform of Aconite prepared by the modified Squire process showed gravimetrically 0·133 p.c. and 0·153 p.c. by titration; Chloroform of Aconite prepared by the *B.P.C.* process showed 0·26 p.c. gravimetrically and 0·268 p.c. by titration. Chloroform of Aconite by the modified Squire process had a specific gravity of 1·472 and contained 0·73 p.c. w/v of total solids; Chloroform of Aconite prepared by the *B.P.C.* process had a specific gravity of 1·412 and contained 1·67 p.c. of total solids.

LINIMENTUM ACONITI COMPOSITUM (*Squire*).—Chloroform of Aconite, 1; Liniment of Aconite, 7. Sprinkled on impermeable Piline and applied for neuralgia.

Linimentum Aconiti et Chloroformi.—Chloroform, 12·50; Liniment of Aconite, *q.s.* to produce 100.—*B.P.C.*

LINIMENTUM ACONITI COMPOSITUM. *Syn.* A.B.C. Liniment.—Aconite Liniment, Belladonna Liniment, Chloroform Liniment, equal parts.—*Guy's.*

Liniment of Chloroform contains Olive Oil, which will not dissolve in the other Liniments, but it is useful as a lubricant for rubbing. Some prescribers prefer to use Chloroform in place of Chloroform Liniment as follows: Aconite Liniment, 2; Belladonna Liniment, 2; Chloroform, 1.

This form has been included in *B.P.C.*

PIGMENTUM IODI CUM ACONITO.—*See* Iodine.

TROCHISCI ACONITI.—Each lozenge contains ½ minim Tincture of Aconite.

Dose.—One Lozenge every half-hour or hour in tonsillitis and febrile affections of the throat.

Pastilles of Aconite are made of two strengths, ½ minim of Tincture of Aconite and 1 minim of the Tincture. Prescribers should indicate the strength required.

Emplast. Aconiti, also **Emp. Aconiti et Belladonnæ,** are made in rubber combination.

ACONITINA.

ACONITINE.

$C_{33}H_{45}NO_{12}$, eq. 642·53.

A crystalline Alkaloid, obtained from Aconite Root. It forms colourless or white odourless hexagonal rhombic prisms, which should be preserved in well-stoppered glass bottles of a dark amber tint.

Solubility.—Almost insoluble in Water; 1 in 35 of Alcohol (90 p.c.); 1 in 45 of Ether; 1 in 1 of Chloroform; soluble in Oleic Acid.

Medicinal Properties.—It relieves acute nervous pain when rubbed on the part in the form of **ointment,** producing a tingling sensation followed by numbness. Care must be taken that it does not come in contact with a mucous surface, such as the conjunctiva, or with abraded skin.

It has been applied with marked benefit in trigeminal neuralgia, and to relieve the pain of *acute* rheumatism and gout.

Dose.—As a pure crystalline Aconitine would probably be fatal to an adult in a dose of 3 milligrammes ($\frac{1}{22}$ grain), the maximum dose should not exceed $\frac{1}{10}$ milligramme ($\frac{1}{660}$ grain) pro dosi, or $\frac{5}{10}$ milligramme ($\frac{1}{132}$ grain) per diem, and the commencing dose should be smaller.

Solutions of the alkaloid are prone to decomposition; aqueous or alcoholic solutions should therefore be slightly acidified with **Hydrochloric Acid,** or crystallised **Aconitine Nitrate** (official in *Fr.*) should be used.

Two new Aconitines, extracted from Aconite roots indigenous to India, have formed the subject of lengthy papers in the *J.C.S. Trans.* '05, 1621, 1636. Indaconitine is the alkaloid of *Aconitum chasmanthum*, Stapf, and Bikhaconitine, the alkaloid of *Aconitum spicatum*, Stapf. The pharmacology of these two alkaloids has been studied, and the conclusions arrived at (*L.* '05, ii. 1347) that Indaconitine and Bikhaconitine may be substituted for Aconitine and Pseudaconitine for internal use. Indaconitine is administrable in the same dose as Aconitine from *A. Napellus* and Bikhaconitine in proportion of 0·75 of the unit dose of Aconitine, whilst for local application they may be used as constituents of ointments in similar proportions to the Aconitine of *A. Napellus.*

Official Preparation.—Unguentum Aconitinæ.

Not Official.—Oleatum Aconitinæ.

Foreign Pharmacopœias.—Official in Fr., m.p. 194° C.; Ital., m.p. 186°; Mex., m.p. not given; Span., m.p. 183°; U.S., m.p. *see* below; all are crystalline products; Hung. specifies 'German Aconitine,' a powder, m.p. 85°; Port., a powder, m.p. 85°. Not in the others.

Pseudaconitine.—A highly toxic crystalline alkaloid obtained from *Aconitum ferox;* only slightly soluble in Water, but readily in Alcohol and Chloroform, less readily in Ether. Dunstan gives m.p. as 201° C.—*J.C.S. Trans.* '97, 353.

Tests.—Aconitine melts at 188·5° C. (371·3° F.); 189° to 190° C. (372·2° to 374° F.), *B.P.* It is distinguished by the characteristic sensation of tingling and numbness which is produced on moist mucous surfaces by extremely dilute solutions of the alkaloid or its salts. The solution of the alkaloid in Alcohol (90 p.c.) is dextrogyrate, whilst solutions of the salts are lævogyrate. A dilute aqueous solution of the alkaloid rendered faintly acid by the addition of Acetic Acid yields a characteristic red crystalline precipitate when Potassium Permanganate Solution is added in slight excess. On saponification Aconitine yields Acetic and Benzoic Acids and Aconine. The preparation of the Aurichloride and a determination of its melting point have been recommended as a means of identifying the alkaloid, but *B.P.* makes no reference to these characteristics. The melting point of pure Aconitine Aurichloride is 135·5° C. (275·9° F.). Aconitine is distinguished from Pseudaconitine, Veratrine and Atropine by not yielding any violet-red coloration when the residue left on the evaporation of a small quantity with a few drops of Nitric Acid is moistened with one or two drops of an alcoholic solution of Potassium Hydroxide.

Melting Point.—383° F. (195° C.) on rapidly heating, *U.S.P.*; when slowly heated it decomposes and melts at 182° C. (359·6° F.), and on ignition it leaves no residue, *U.S.P.*

Sulphuric or Nitric Acid.—No colour is produced when Aconitine is dropped upon Sulphuric Acid or Nitric Acid, but an orange colour is produced when it is rubbed with Sulphuric Acid containing a crystal of Ammonium Vanadate, *U.S.P.*

Potassium Permanganate Solution.—Dilute solutions (up to 1-4000) of the alkaloid, when faintly acidulated with Acetic Acid, give a red crystalline precipitate with a few drops of 1 p.c. w/v Potassium Permanganate Solution, *B.P.*; the *U.S.P.* uses a 1–1000 dilution with 1 drop of Tenth-normal Permanganate Solution and does not acidulate. Aconitine containing decomposition products (Amorphous Aconitine) produces this precipitate only in solutions of not less than 1–200, while Cocaine, Hydrastine and Papaverine yield similar precipitates, but only when in more concentrated solutions, *U.S.P.*

Mercuric Potassium Iodide T.S., Tannic Acid T.S., and Gold Chloride T.S. give precipitates with dilute solutions of Aconitine, but Platinic Chloride T.S., Mercuric Chloride T.S., and Picric Acid T.S. only in concentrated solutions, *U.S.P.*

Preparation.

UNGUENTUM ACONITINÆ. Aconitine Ointment.

Dissolve 10 grains of Aconitine in 80 grains of Oleic Acid by the aid of gentle heat; and mix with 410 grains of Lard (1 in 50).

Not Official.

OLEATUM ACONITINÆ.—Aconitine, 2 grains; Oleic Acid, 98 grains; dissolve.

Dr. Shoemaker states that this has a slight local action, and it can be used in mild cases of neuralgia.—*B.M.J.* '84, ii. 750.

This has been incorporated in the *B.P.C.* under the title **Oleinatum Aconitinæ,** *syn.* Oleate of Aconitine.

ACTÆA RACEMOSA.

See CIMICIFUGÆ RHIZOMA.

ADEPS.

LARD.

FR., AXONGE; GER., SCHWEINESCHMALZ; ITAL., GRASSO SUINO; SPAN., GRASA DE CERDO.

A soft white solid having a characteristic though not rancid odour and a bland taste. It is the purified abdominal fat of the Hog, *Sus scrofa.*

Adeps Induratus is Lard deprived of its oil by pressure, and the oil is known as **Lard Oil.**

Solubility.—1 in 22 of Ether, and 1 in 16 of Oil of Turpentine; almost insoluble in Alcohol (90 p.c.).

Medicinal Properties.—Emollient. Added to poultices to prevent them drying and sticking to the skin.

Official Preparation.—Adeps Benzoatus. Used in the preparation of Emplastrum Cantharidis, Pilula Phosphori, and the following Ointments: Aconitine, Atropine, Cocaine, Iodine, Mercury, Mercuric Nitrate, Resin, and Veratrine,

Foreign Pharmacopœias.—Official in Austr. (Axungia Porci), Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap. (Adeps Suillus), Norw. (Axungia), Mex. (Manteca de Cerdo), Port. (Banha), Russ., Span., Swed., Swiss and U.S.

Tests.—The distinguishing tests for Lard are its physical appearance, melting point, specific gravity, the percentage of Potassium Hydroxide absorbed in saponification, and its Iodine absorption. *B.P.* and *P.G.* include the melting point, but no specific gravity. Melting point and specific gravity are both included in *U.S.P.* Lard melts at from 35° to 45° C. (95° to 113° F.); the *B.P.* states that it fuses at 37·8° C. (100° F.) yielding a clear liquid at a somewhat higher temperature; the *U.S.P.* gives 38° to 40° C. (100·4° to 104° F.); the *P.G.* 36° to 42° C. (96·8° to 107·6° F.). It has a specific gravity at 99° C. (210·2° F.) compared with Water at 15·5° C. (60° F.) of about 0·860; the *U.S.P.* states about 0·917 at 25° C. (77° F.) and about 0·904 at 40° C. (104° F.) compared with Water at 25° C. (77° F.). It has a Saponification value of 192 to 196·5. It has an Iodine value of 52 to 62, and should contain but a trace of free acid. Samples examined in the author's laboratory possessed a Saponification value of 192 to 197, and an Iodine value of 50 to 56. Neither *B.P.*, *U.S.P.* nor *P.G.* include the percentage of Potassium Hydroxide absorbed on saponification; the *Austr.* gives a Saponification value of 194 to 197. *P.G.*, *Ital.* and *Austr.* include an Iodine absorption; *P.G.* not less than 46 p.c. nor more than 66 p.c.; *Ital.*, 55 p.c. to 60 p.c.; *Austr.*, 48 p.c. to 60 p.c.; the *U.S.P.* does not include this constant.

The more generally occurring impurities are Water, Salt, an undue proportion of free Acid, Cotton Seed Oil, Beef Stearin, and Starch. No official test is given for Beef Stearin, but the Lard is required to be entirely soluble in Ether. The amount of Water may be determined by heating a weighed quantity of 5 grammes of the sample in a flat-bottomed porcelain dish at a temperature of about

105° C. (221° F.). A rough idea of the amount of Water may be obtained by the behaviour of the sample when shaken with Carbon Bisulphide. Salt, if present, is shown by the Silver Nitrate test described below. Cotton Seed Oil may be detected by the test with Alcoholic Silver Nitrate Solution given in the small type below. The *B.P.*, *U.S.P.* and *P.G.* methods of determining the free acid are essentially the same, and require that when a weighed quantity of 10 grammes of the Lard is dissolved in 10 c.c. of Chloroform and mixed with 10 c.c. of Alcohol of the strength required by the respective Pharmacopœias, after the addition of 2 drops of Phenolphthalein Test-solution not more than 0·2 c.c. of Volumetric Sodium Hydroxide Solution should be required to produce a permanent red colour. This indicates a limit of 0·56 p.c. calculated as Oleic Acid.

The test given for Cotton Seed Oil in the *B.P.* and *P.G.* is the Becchi's Silver Nitrate test, and it is still included in the *U.S.P.* for determining the presence of more than about 5 p.c. of Cotton Seed fats. The test is preferably performed on the fatty acids and not on the Lard direct. Mr. E. J. Bevan has informed the author that a test which will readily detect even 1 p.c. of Cotton Seed Oil consists in heating in a salt bath for about half an hour 3 c.c. of the Lard with 1 c.c. of a 1 p.c. solution of Sulphur in Carbon Disulphide. This test slightly modified has been included in the Eighth Decennial Revision of the *U.S.P.* to prove the absence of Cotton Seed Oil and certain other fats. For the detection of Beef Stearin the microscopical appearance of the crystals separating out from the ethereal solution of the Lard is generally relied upon. A portion of the sample when boiled with Water, cooled, and a few drops of Iodine Solution added, should yield no blue coloration, indicating the absence of Starch.

Silver Nitrate Solution.—Distilled Water boiled with Lard, filtered, and acidulated with Nitric Acid should yield no white precipitate soluble in Ammonia Water, with T.S. of Silver Nitrate, *U.S.P.*

Alcoholic Silver Nitrate Solution.—If 5 c.c. of melted and filtered Lard be thoroughly mixed with a solution prepared by dissolving 0·1 gramme Silver Nitrate in 10 c.c. Alcohol (94·9 p.c.) and 2 drops of Nitric Acid, and then heated for 5 minutes on a water-bath and vigorously shaken, the fatty layer on separation should not have assumed a dark reddish or brown colour; nor should there be any dark colour at the junction of the two liquids, *U.S.P.* The *B.P.* test is essentially the same as the *U.S.P.*, except that the *B.P.* prepares the 5 c.c. of Silver Nitrate Solution by dissolving 0·05 gramme of Silver Nitrate in 5 c.c. of Alcohol (90 p.c.). The *P.G.* test is made with 5 grammes of melted Lard and a solution of 0·05 gramme Silver Nitrate in 2 grammes of Ether and 10 grammes Alcohol, and the mixture is warmed for 15 minutes on the water-bath.

Sulphur in Carbon Bisulphide.—2 c.c. of melted and filtered Lard are mixed with 1 c.c. each of Amyl Alcohol and a 1 p.c. solution of Sulphur in Carbon Disulphide in a test-tube. The test-tube is immersed to one-third or half its depth in boiling salt Water. No reddish colour should develop in the mixture in from 10 to 15 minutes, *U.S.P.*

Saponification.—A mixture of 2 parts Lard, 3 parts Potassium Hydroxide Solution, and 2 parts of Alcohol, when boiled until it clarifies, should produce, on the addition of 50 parts of Water and 10 parts of Alcohol, a clear or only faintly opalescent liquid, *P.G.*

Preparation.

ADEPS BENZOATUS. Benzoated Lard.

Digest 210 grains of Benzoin in 16 oz. of melted Lard on a water-bath for two hours, strain, and stir whilst cooling. (1 in 33)

Benzoated Lard should not be used for **eye ointments** as it is irritating.

Benzoated Suet (**Sevum Benzoatum**) *Ind.* and *Col. Add.* should be used in India, in place of Benzoated Lard.

Official Preparations.—Used for making the following Ointments: Belladonna, Cantharides, Chrysarobin, Galls, Mercuric Iodide, Mercuric Oleate, Mercurous Chloride, Potassium Iodide, Stavesacre, Sulphur, Sulphur Iodide, and Zinc.

Foreign Pharmacopœias. Official in Dan., Dutch, Ital. (Grasso con Benzoino), Norw., Swed. and U.S., Benzoin 2, Lard 100; Russ., Benzoin 2, Lard 100, dried Sodium Sulphate 5; Mex. (Pomedo Benzoada), Tincture of Benzoin 5, Lard 100; Fr., Benzoin 3, Lard 100; Ger. and Jap., 1 Acid. Benz. in 100; Swiss, Lard 100, Benzoin 4, Dried Sodium Sulphate 6; or Lard 10, Ethereal Tincture of Benzoin 1. Not in the others.

Not Official.

UNNA'S SALVE MULLS.—The bases of these are hog's lard and beef suet (singly or combined), with which are incorporated various medicaments, spread on muslin.

ADEPS LANÆ.

WOOL FAT.

Fr., Graisse de Laine; Ger., Wollfett; Ital., Lanolina; Span., Lanolina.

A pale yellow, tenacious, unctuous product possessing a faint characteristic odour. It is the purified fat of sheep's wool, consisting chiefly of Cholesterin, Iso-cholesterin, and their Esters.

Solubility.—Readily soluble in Chloroform and Ether, but only partially so in Alcohol (90 p.c.). Its own weight of Water can be incorporated with it.

Medicinal Properties.—Emollient; is very readily absorbed by the skin, and thus promotes the action of remedies combined with it.

Official Preparation.—Adeps Lanæ Hydrosus.

Not Official.—Unguentum Lanolini, Unguentum Adipis Lanæ, Adeps Lanæ cum Oleo.

Foreign Pharmacopœias.—Official in Austr., Dan., Dutch, Fr., Ger., Ital. (Lanolina), Jap., Russ., Span., Swed., Swiss and U.S. Not in the others.

Tests.—The distinguishing tests for Adeps Lanæ are the melting point, which should be about 40° C. (104° F.), and the formation of the purple-red colour of Cholesterin when its solution in Chloroform is poured gently on to the surface of Sulphuric Acid. It is preferable to use an acid containing a trace of Water for performing this test.

The *B.P.* gives the melting point as 40° to 44·4° C. (104° to 112° F.); the *U.S.P.* and the *P.G.* about 40° C. (104° F.); the *U.S.P.* states that at a higher temperature it vaporises and burns with a luminous sooty flame; the *P.G.* that Wool Fat burns with a luminous very smoky flame.

The percentage of Potassium Hydroxide required for saponification, as based upon Helbing's saponification test, affords a good criterion of the purity of the sample, but no official mention is made of this test. A thoroughly purified Wool Fat will combine with about 8 to 9 p.c. of Potassium Hydroxide; Glycerin Fats give much higher figures (Lard, 19·5 p.c. ; Olive Oil, 18·0 p.c. ; Cocoa Nut Fat, 26 p.c.); while Petroleum bases, being unsaponifiable, do not consume any.

The more generally occurring impurities are mineral matter, an undue amount of free acid, and nitrogenous organic matter. The *B.P.*, *U.S.P.* and *P.G.* all require that the residue left on ignition shall not be alkaline to Litmus, but differ in the amount of mineral residue permissible. *B.P.* and *U.S.P.* state not more than 0·3 p.c. ; *P.G.* allows at the highest 0·5 p.c. The *B.P.* does not allow more than 0·28 p.c. of free Acid calculated as Oleic Acid; *P.G.* not more than 0·14 p.c. ; and *U.S.* not more than 0·7 p.c. In carrying out the determination of the free acid, the *B.P.* uses 25 c.c. Ether as a solvent for the 10 grammes of Wool Fat and employs Volumetric Sodium Hydroxide Solution, of which not more than 0·1 c.c. should be required; the *U.S.P.* and *P.G.* use 2 grammes of the Wool Fat for the determination, employing 10 c.c. of Ether as a solvent; the *U.S.P.* uses Normal Volumetric Potassium Hydroxide Solution for the titration and the *P.G.* Tenth-normal Volumetric Potassium Hydroxide Solution; the *U.S.P.* stipulates that only 1 drop of the Normal Volumetric Solution shall be required; the *P.G.* 0·1 c.c. of Tenth-normal Volumetric Potassium Hydroxide. The *B.P.* does not include a test for the absence of Glycerin, but such a test is included in both the *U.S.P.* and *P.G.*, as well as a test for ensuring the absence of Chlorides, due to Chlorine-substitution products formed during the bleaching process. In carrying out the test for Glycerin both the *U.S.P.* and the *P.G.* work upon the filtrate obtained by shaking the Wool Fat with boiling Water, both Pharmacopœias employing 10 grammes of the Wool Fat and 50 c.c. of Water, and requiring that the clear separated aqueous liquid shall not yield a residue of Glycerin on evaporation ; nor vapours of Ammonia when boiled with a solution of an alkali Hydroxide, the *U.S.P.* employing Potassium Hydroxide T.S., the *P.G.* Calcium Hydroxide Solution ; the latter portion of the test is intended to detect nitrogenous organic matter. In carrying out the test the *B.P.* boils the Wool Fat itself with Sodium Hydroxide Solution. The *P.G.* tests another portion of 10 c.c. of the clear separated aqueous liquid with 2 drops of Potassium Permanganate Solution (0·1 p.c. w/w), requiring that the mixture shall maintain its red colour. This test is intended as confirmatory evidence of the absence of Glycerin and other readily oxidisable organic impurities. The absence of Chlorides is determined by the test with Alcoholic Silver Nitrate Solution given in the small type below.

Sulphuric Acid.—If a solution of Wool Fat in Chloroform (1–50 *P.G.* and *U.S.P.*) be poured as a layer over Sulphuric Acid, a zone of deep brownish-red colour gradually appears at the line of contact of the two liquids, *P.G.* and *U.S.P.* (the *B.P.* gives no quantities and states purple-red colour); it attains its deepest shade after about 24 hours, *P.G.*

Alcoholic Silver Nitrate Solution.—1 gramme of Wool Fat boiled with 20 c.c. Alcohol, and filtered, yields a filtrate which on cooling should not be rendered turbid by alcoholic Solution of Silver Nitrate (1 20), *P.G.*, *U.S.P.*, or a turbidity disappearing on warming, *P.G.*

Preparation.

ADEPS LANÆ HYDROSUS. HYDROUS WOOL FAT.

A nearly white, or yellowish-white, unctuous mass prepared by incorporating 3 of Distilled Water with 7 of Wool Fat by rubbing together in a warm vessel. Used as a basis for ointments. It does not become rancid. Mixes with about half its weight of Water. It is better for ointments when mixed with an equal weight of Soft Paraffin.

Official Preparations.—Used in the preparation of Unguentum Conii, and Unguentum Hamamelidis.

Foreign Pharmacopœias.—Official in Austr. (Adeps Lanæ Hydrosus), Norw. (Lanolinum), Fr. (Lanoléine), Ital. and Mex. (Lanolina), Dan., Dutch, Ger., Jap. and Russ. (Adeps Lanæ cum Aquâ), Swed. (Adeps Lanæ), Swiss (Lanoline), U.S. Not in the others.

Tests.—Hydrous Wool Fat melts at about 40° C. (104° F.) separating into two layers, an upper oily layer and a lower aqueous layer. It is officially required to yield not less than 70 p.c. of residue when dried till constant in weight at a temperature of about 100° C. (212° F.), thus indicating a loss of not more than 30 p.c. This is also the *U.S.P.* limit, the latter Pharmacopœia stating in addition that the yellowish tenacious unctuous mass remaining should be completely soluble in Ether or Chloroform, and only sparingly soluble in Alcohol, should respond to the tests given under Adeps Lanæ. The *P.G.* requires that at the temperature mentioned it shall not lose more than 26 p.c. of its weight, and that the residue remaining after the separation of the Water shall answer the tests for Wool Fat and may be tested for its purity by similar methods to those employed for the anhydrous fat.

Not Official.

UNGUENTUM LANOLINI.—Hydrous Lanoline, 2; Soft Paraffin, 1.

UNGUENTUM ADIPIS LANÆ (*Ger.*).—Wool Fat (anhydrous), 20; Water, 5; Olive Oil, 5. All by weight.

An improvement on this is the following:—

ADEPS LANÆ CUM OLEO.—Hydrous Wool Fat, 9; Almond Oil, 1.

This has been incorporated in the *B.P.C.* as follows:—Hydrous Wool Fat, 90; Olive Oil, 10; under the title **Unguentum Adipis Lanæ.**

Not Official.

ADHATODA.

The fresh and the dried leaves of *Adhatoda Vasica*, are official in *Ind.* and *Col. Add.* for India and the Eastern Colonies: as are also **Extractum Adhatodæ Liquidum** (1 in 1), dose 20 to 60 minims=1·2 to 3·6 c.c.; **Succus Adhatodæ**, the freshly expressed and strained juice of the bruised fresh leaves, dose 1 to 4 fl. drm.=3·6 to 14·2 c.c., and **Tinctura Adhatodæ** (1 in 8), dose 30 to 60 minims=1·8 to 3·6 c.c.

Not Official.

ADONIS.

The leaves and stalks of *Adonis vernalis*, L.

Medicinal Properties.—A cardiac tonic. Useful in mitral and aortic regurgitation, relieving intracardiac pressure and præcordial pain.—*L.* '88, ii. 1012. A useful adjunct to bromides in epilepsy.—*L.* '94, ii. 1288; *B.M.J.E.* '95, i. 12, and '98, i. 44.

Dose.—2 to 6 grains = 0·13 to 0·4 gramme in **powder,** or the equivalent of an **infusion, tincture,** or **fluid extract.**

Foreign Pharmacopœias.—Official in Ital., Russ., Span. and Swiss. Not in the others.

ADONIDIN.—A glucoside, very deliquescent, soluble in Water and Alcohol (90 p.c.).

Dose.—⅙ to ½ grain = 0·01 to 0·03 gramme. Generally given in pill.

ADRENALIN.—*See* **SUPRARENAL GLAND.**

ÆTHER.

ETHER.

FR., ETHER; GER., AETHER; ITAL., ETERE; SPAN., ETER.

A light, colourless, volatile, mobile liquid, possessing a strong characteristic odour and containing not less than 92 p.c. by volume of Ethyl Oxide $(\mathbf{C_2H_5})_2\mathbf{O}$, eq. 73·52. It is also known as Ethyl Ether, and Sulphuric Ether. It is very volatile, and gives off a very inflammable and very heavy vapour.

It is prepared by the action of Sulphuric Acid upon Alcohol, and subsequent distillation and rectification of the product.

This product contains both Alcohol and Water, but Æther Purificatus (*see* below) is almost free from both.

Solubility.—1 in 10 of Water; mixes in all proportions with Alcohol (90 p.c.).

B.P. states that it is miscible in all proportions with Chloroform, but the mixture forms a turbid liquid, owing to the presence of Water in the Ether.

Water dissolves a tenth of its volume of Ether, and reciprocally Ether takes up about the same proportion of Water.

Æther dissolves Corrosive Sublimate, Red Mercuric Iodide, Iodine and Bromine freely, Sulphur and Phosphorus sparingly. It is also a solvent of the volatile and fixed oils, many resins and balsams, caoutchouc, and most of the organic vegetable alkaloids. It does not dissolve Potassium or Sodium Hydroxides, in which respect it differs from Alcohol.

Medicinal Properties.—It is a rapid and powerful diffusible stimulant, antispasmodic and carminative, and is of great use in syncope or heart-failure from any cause, dyspnœa, gastralgia, flatulence, spasmodic asthma and angina pectoris. It excites secretion from the mucous surfaces of the alimentary tract, and, as it stimulates the pancreas, it is sometimes given with Cod Liver Oil.

As an anæsthetic, *see* Æther Purificatus and Æther Methylatus.

Dose.—For repeated administration, 10 to 30 minims = 0·6 to 1·8 c.c.; for a single administration, 40 to 60 minims = 2·4 to 3·6 c.c.

When used **hypodermically** for heart failure the dose is 15 to 30 minims = 0·9 to 1·8 c.c.

Prescribing Notes.—*Best prescribed as Spirit of Ether, which mixes readily with Water.* **'Perles'** *are prepared.*

Official Preparations.—Æther Purificatus, Spiritus Ætheris, Spiritus Ætheris Compositus. Used in the preparation of Collodium, Extractum Filicis Liquidum. **Æther Purificatus** is used in the preparation of Extractum Stophanthi, and **Spiritus Ætheris** in Tinctura Lobeliæ Ætherea.

Not Official.—Æther Methylatus, Mistura Ætheris cum Ammonia, Sirop d'Ether, Spiritus Ætheris Muriaticus.

Foreign Pharmacopœias.—*See* under Æther Purificatus.

Tests.—The distinguishing tests for Æther are its volatility as indicated by its boiling point, the specific gravity, and the odour. It has a boiling point of about 40° C. (104° F.); the *B.P.* gives the boiling point as below 40·5° C. (105° F.). Æther sp. gr. 0·735 has been official in Great Britain for many years, but Foreign Pharmacopœias only recognise the fluid which is official in the *B.P.* as Æther Purificatus, *see* below.

The more generally occurring impurities are an undue amount of Acid, or of Alcohol, extractive matter, and organic impurities produced during its manufacture and which have escaped separation during the process of rectification.

It should not possess an acid reaction towards blue Litmus paper, indicating the absence of acidity. When shaken with Water the volume should not be decreased by less than one-tenth, indicating the absence of excess of Alcohol. It should be completely volatilised without leaving a residue, indicating the absence of extractive matter; when mixed with an equal volume of Sulphuric Acid, the mixture kept well cooled, it should yield little or no coloration, indicating the absence of organic impurities.

ÆTHER PURIFICATUS. Purified Ether.

A colourless, transparent, very volatile, mobile and inflammable liquid from which the greater part of the Alcohol has been removed by washing with Water, and the Water by distillation over a dehydrating agent. *U.S.P.* describes it as containing about 96 p.c. by weight of Ethyl Oxide.

It is the **Æther pro narcosi** of the German and Swedish Pharmacopœias and the official Æther of the U.S.

Medicinal Properties.—Used for producing general **anæsthesia** by **inhalation.**

It has also been used as a **spray** for obtaining local anæsthesia in minor surgery, and to relieve severe neuralgic pain, but as the lower the boiling point of the Ether the more complete is the anæsthesia, **Methylated Ether**, sp. gr. 0·717 (*see* below), is preferable for use with the **spray.**

Ether was first used as an anæsthetic for capital operations in 1846, and

Purified Ether is preferred by some to Chloroform, as it has a less depressing effect upon the heart, vessels, and respiratory centre. It is used also in conjunction with Nitrous Oxide for minor operations in dentistry and surgery.

Official Preparation.—Used in the preparation of Extractum Strophanthi.

Foreign Pharmacopœias.—Official in Austr., sp. gr. 0·720; Russ., sp. gr. 0·725; Belg., Dutch, Fr., Ger. and Jap., sp. gr. 0·720; Fr., also sp. gr. 0·724; Hung., sp. gr. 0·724 to 0·728; Port., sp. gr., 0·728; Span. (Eter), sp. gr. 0·720; Dan., Norw., Ital. (Etere), Swed. and Swiss, sp. gr. 0·720 to 0·722; U.S., sp. gr. 0·716 to 0·717 at 25° C. (77° F.); Mex. (Eter Sulfurico), sp. gr. 0·720.

Tests.—The distinguishing tests for Æther Purificatus are its boiling point, its specific gravity, its peculiar odour and physical appearance. The *B.P.* does not give a boiling point, but requires that it should not commence to distil below 34·5° C. (94·1° F.); the *U.S.P.* gives the boiling point at 35·5° C. (96° F.); the *P.G.* as 35° C. (95° F.). The specific gravity given in the *B.P.* is from 0·720 to 0·722, that of the *U.S.P.* 0·716 to 0·717 at 25° C (77° F.); that of the *P.G.* 0·720.

The more generally occurring impurities are Methylic Ether, extractive matter, excess of Water, Aldehyde, acid, organic impurities, and Hydrogen Peroxide. Methylic Ether may be detected, if present, by the lowering of the boiling point. Both the *U.S.P.* and the *P.G.* require that Ether shall leave no residue on evaporation, indicating the absence of extractive matter. The *P.G.* states that when allowed to evaporate at ordinary temperature it leaves a damp ring which should not redden blue Litmus paper. The three Pharmacopœias differ considerably in their methods of testing for Aldehyde, Hydrogen Peroxide, and excess of Water. All three employ Potassium Hydroxide as a test for Aldehyde; the *B.P.* and *P.G.* use the solid form, *U.S.P.* the solution. The *B.P.* gives neither a time limit within which no coloration shall be produced, nor quantities; *U.S.P.* uses 10 of Ether to 1 of Potassium Hydroxide Solution and a time limit of 'within one hour,' whilst *P.G.* states no quantity for the test, but requires that no yellow colour shall be produced within six hours, the mixture being protected from the light.

In testing for Hydrogen Peroxide, *B.P.* uses Potassium Bichromate acidified with Sulphuric Acid, requiring that the ethereal liquid shall not develop a blue colour; the *P.G.* employs Potassium Iodide Solution and protects the mixture from the light, no coloration should be produced within one hour; whilst the *U.S.P.* does not include a test for Hydrogen Peroxide. Excess of Water is officially detected by mixing equal volumes of Ether and Carbon Bisulphide, when a clear solution should be obtained; in the *U.S.P.* the test is performed with Ether-saturated Water, and is made quantitative by employing equal volumes of the menstruum and Ether, and noting the decrease in volume of the ethereal liquid, 20 c.c. of the sample shaken with 20 c.c. of Ether-saturated Water should not measure less than 19·2 c.c. The *P.G.* does not include a test for excess of Water.

Odorous impurities, if present, may be detected by the odour imparted to clean, odourless filter paper when the Ether is allowed to spontaneously evaporate. Neither the *B.P.* nor the *P.G.* states the quantity to be used for the test; the *U.S.P.* evaporates 10 c.c. in portions; all three Pharmacopœias require that the filter paper, after the evaporation of the Ether, shall possess no odour.

Evaporation. Clean, odourless filter paper moistened with Ether, and the Ether allowed to spontaneously evaporate, should be free from any foreign odour when the Ether has evaporated, *B.P.*; the *P.G.* and *U.S.P.* allow 10 c.c. to evaporate.

Preparations.

SPIRITUS ÆTHERIS. Spirit of Ether. The Hoffmann's Anodyne of the Continental Pharmacopœias.

Ether, 1; Alcohol (90 p.c.), 2. (1 in 3)

Specific Gravity.—0·806 to 0·811.

Dose.—For repeated administration, 20 to 40 minims = 1·2 to 2·4 c.c.; for single administration, 60 to 90 minims = 3·6 to 5·4 c.c.

Foreign Pharmacopœias.—Official in Austr., Dan., Ger., Hung., Jap., Norw., Swed. and Swiss, 1 and 3; Belg. (Æther Sulphuricus Alcoholicus), 468 in 1000; Dutch (Æther cum Spiritu), 1 and 1, sp. gr. 0·777 to 0·782; Fr. (Ether Alcoolisé), 1 and 1, sp. gr. 0·783; Ital. (Liquore Anodino di Hoffmann), 1 and 1; Mex. (Licor de Hoffmann), Æther 1, Alcohol 90 p.c., 1; Port. (Æther Alcoolisado), 7 and 3; Russ., 1 and 2, sp. gr. 0·800; Span. (Eter Sulfurico Alcoholizado), 4 and 1; U.S., 3¼ in 10. All by weight, except U.S.

Dan., Norw. and Swed. include also **Æther Spirituosus Camphoratus**, containing 15 p.c. of Camphor.

SPIRITUS ÆTHERIS COMPOSITUS. Compound Spirit of Ether. *B.P.Syn.*—Hoffmann's Anodyne.

Ether, 5½; Alcohol (90 p.c.), 38; and an undefined quantity of ethereal liquid, obtained by the action of 36 of Sulphuric Acid on 40 of Alcohol (90 p.c.), and subsequent treatment.

The official directions are founded on the formula of the old Dublin Pharmacopœia.

Dose.—For repeated administration, 20 to 40 minims = 1·2 to 2·4 c.c.; for a single administration, 60 to 90 minims = 3·6 to 5·4 c.c.

Foreign Pharmacopœias.—Official in U.S., Ether, 325; Alcohol, 650; Ethereal Oil, 25. Not in the others.

Tests.—The distinguishing tests are the sp. gr. which should be about 0·810, and the production of an opalescent mixture on the addition of Water. The more generally occurring impurities are those of an empyreumatic nature, having their origin in the process of manufacture, and which may be detected by any objectionable odour imparted to the residue left on the spontaneous evaporation of a few c.c. of the sample.

Not Official.

ETHER FROM METHYLATED SPIRIT. *Syn.* Æther Methylatus; Methylated Ether.—Sp. gr. 0·717. It can be purified to such an extent by washing and redistillation as to be scarcely distinguishable from that made from pure Spirit. The Methylic Ether being so extremely volatile is almost wholly lost during the purification.

An Ether, sp. gr. 0·715, can be obtained in limited quantity by careful working; occasionally samples are drawn over at 0·713, in cold weather.

Medicinal Properties.—It is largely employed as a **spray** for local anæsthesia, as well as for **inhalation**. As in the case of 'Methylated Chloroform,' the impurities from the Wood Spirit, employed in the manufacture, can be completely eliminated.

Ether can be made more volatile for use with the **spray** by the addition of 20 per cent. of a light Petroleum Ether.

Ether from Methylated Spirit, sp. gr. 0·720 washed and redistilled, is also supplied for **inhalation**. It is *not* so suitable as the above for the **spray** because it volatilises less rapidly.

MISTURA ÆTHERIS CUM AMMONIA.—Spirit of Ether, 30 minims; Aromatic Spirit of Ammonia, 30 minims; Distilled Water, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

Mistura Ammoniæ et Ætheris.—Aromatic Spirit of Ammonia, 30 minims; Spirit of Ether, 30 minims; Chloroform Water, to make 1 oz.—*St. Mary's.*

SIROP D'ETHER. SYRUPUS CUM ÆTHERE.—Ether (sp. gr. 0·720), 2; Distilled Water, 23; Alcohol (90 p.c.), 5; Syrup, 70; all by weight.—*Fr.*

This has been incorporated in the *B.P.C.* under the title **Syrupus Ætheris Compositus.**

SPIRITUS ÆTHERIS MURIATICUS. *Syn.*—SP. SALIS DULCIS; CLUTTON'S FEBRIFUGE SPIRIT.

A colourless liquid. Sp. gr. 0·860.

A very old preparation, still prescribed for pyrexia, and cold in the head.

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Norw. (Æther Chloratus Spirituosus).

ÆTHER ACETICUS.

ACETIC ETHER.

FR., ACÉTATE D'ETHYLE; GER., ESSIGÄTHER; ITAL., ETERE ACETICO; SPAN., ETER ACETICO.

A transparent, colourless, volatile, inflammable liquid, possessing a characteristic ethereal odour and taste. It consists almost entirely of Ethyl Acetate, $C_2H_5C_2H_3O_2$, eq. 87·40, with a small quantity of Ethylic Alcohol, Water and possibly traces of organic impurities.

A good commercial specimen should contain 90 p.c. of Ethyl Acetate and about 10 p.c. of Ethylic Alcohol.

It should be kept in well-stoppered, amber-tinted bottles, and in a cool atmosphere.

Solubility.—About 1 in 9 of Water. Pure Acetic Ether is miscible in all proportions with Alcohol (90 p.c.), and with Ether, but Acetic Ether of *B.P.* specific gravity is not soluble in all proportions in Chloroform, but if such Ether be dehydrated over Calcium Chloride or Potassium Carbonate it will then mix with Chloroform in all proportions, but the purified product has a specific gravity of 0·895.

Medicinal Properties. Antispasmodic, stimulant, and carminative. It is also used as a sedative **inhalation** in irritation of the larynx, 30 minims in a pint of Water.

Dose.—For repeated administration, 20 to 40 minims = 1·2 to 2·4 c.c.; for a single administration, 60 to 90 minims = 3·6 to 5·4 c.c.

Official Preparation.—Used in the preparation of Liquor Epispasticus.

Foreign Pharmacopœias. Official in Austr., Belg., Dan., Dutch, Ger., Jap., Norw. and Russ., sp. gr. 0·900 to 0·904; Hung., sp. gr. 0·900; Belg., sp. gr. 0·890; Fr., sp. gr. 0·920; Ital. (Etere Acetico), sp. gr. 0·900 to 0·904; Mex. (Eter Acetico) sp. gr. 0·920; Port., sp. gr. 0·920; Span., sp. gr. 0·915; Dan. and Swed., sp. gr. 0·902 to 0·906; Swiss, sp. gr. 0·904; U.S., sp. gr. 0·883 to 0·885 at 25° C. (77° F.).

Tests.—The distinguishing tests for Acetic Ether are its sp. gr. of about 0·900, its boiling point, which should be about 162° C. (323·6° F.), and the limits of temperature between which it distils, 165° and 172° F. (73·9° and 77·8° C.).

It is officially required to have a specific gravity of 0·900 to 0·905; the *U.S.P.* gives 0·883 to 0·885 at 25° C. (77° F.); the *P.G.* 0·900 to 0·904. The official Acetic Ether is the fraction boiling between 73·9° and 77·8° C. (165° and 172° F.); the *U.S.P.* gives the boiling point of Acetic Ether from 72° to 77° C. (161·6° to 170·6° F.); the *P.G.* 74° to 76° C. (165·2° to 168·8° F.).

The more generally occurring impurities are Ethylic Alcohol, Water, free Acetic Acid, readily carbonisable organic impurities, and Ethers other than Acetic derived from impurities in the Ethylic Alcohol used in the process of manufacture. Except by inference the *B.P.* omits a test for excess of Ethylic Alcohol and Water, but both *U.S.* and *P.G.* stipulate that it shall not contain more than 10 p.c., as ascertained by the decrease in volume of the ethereal layer or the increase in volume of the aqueous layer, when a saturated aqueous solution of Acetic Ether is shaken with an equal volume of the specimen under examination. A free acid test performed either with Litmus Solution or paper is common to all three Pharmacopœias, as is also a test with Sulphuric Acid for readily carbonisable organic impurities. The latter test is included in all three Pharmacopœias, but in performing it the *B.P.* simply directs the liquids to be mixed; the *U.S.P.* and the *P.G.* direct that the Acetic Ether be carefully poured as a layer on the acid, and no coloured zone should be produced at the point of contact.

The *B.P.* and *P.G.* require that when evaporated from filter paper no odour shall remain, but do not mention the specific impurities indicated by the test. *U.S.*, on the other hand, state that the final odour should not resemble that of pineapple, indicating the absence of Butylic and Amylic Ethers. It should be completely volatile, and should leave no weighable residue on evaporation.

ÆTHERIS NITROSI SPIRITUS.

See SPIRITUS ÆTHERIS NITROSI.

Not Official.

ÆTHYL BROMIDUM.

ETHYL BROMIDE. HYDROBROMIC ETHER.

FR., BROMURE D'ETHYLE; GER., AETHYLBROMID; ITAL., BROMURO DI ETILE; SPAN., ETER BROMHIDRICO.

C_2H_5Br, eq. 108·17.

A heavy, colourless, mobile and very volatile liquid, which should be preserved in well-stoppered dark amber-tinted bottles. It is best prepared by acting upon Potassium Bromide with Sulphuric Acid in the presence of Alcohol. Its liability to decomposition may be prevented by exclusion of light and air, and by the addition of Alcohol, which lowers the sp. gr.

Shown that the process recommended in the *Companion* (17th edit.) is the correct one. 60 p.c. of the commercial samples stated to be quite unfit for use.—*P.J.* '02, i. 491.

Solubility.—1 in 120 of Water, but will vary with sp. gr. of sample; it mixes in all proportions with Alcohol (90 p.c.) and Ether.

Medicinal Properties.—It is a local and general anæsthetic, more rapid in its action than Chloroform, and occasionally used in conjunction with it. It is useful in minor surgery, also in obstetric practice and in dental operations.

It should be administered in the same manner as Ether; it is very prompt in its action. It should not be given in prolonged operations or in renal disease. Has been used as a **spray** to produce local anæsthesia.

Strongly recommended in dental operations.

Recommended as a general anæsthetic in short operations. Action rapid, and particularly well adapted for children. Dangerous when administered with air, or if administration is protracted. Amount required varies up to 3 fl. drm. = 10·6 c.c.—*L.* '99, ii. 850; *B.M.J.* '02, ii. 589.

Administered by inhalation in a single dose of from 15 to 30 grammes was free from risk, but prolonged administration of repeated doses was dangerous. More than one warning, however, has been given that 30 grammes (6 fl. drm.) is too large and may occasionally give rise to unpleasant symptoms.—*L.* '03, ii. 745.

A **solution**, 1 in 200 of Water, in angina pectoris, dose ½ to 2 oz. = 14·2 to 56·8 c.c.—*M.A.* '87, 24.

Foreign Pharmacopœias.—Fr. (Bromure d'Ethyle); Dutch and Swed. (Brometum Aethylicum); Belg., Ger. and Swiss (Æther Bromatus); Ital. (Bromuro di etile); Mex. and Span. (Eter Bromhidrico); Jap. and Russ. (Æthylum Bromatum). Not in the others.

Tests.—Pure Ethyl Bromide has sp. gr. 1·473. Sp. gr. given in *P.G.* is 1·453 to 1·457. A very pure sample sold as containing 1 p.c. of Alcohol had sp. gr. 1·461, but ordinary samples may run as low as 1·34.

The boiling point of pure Ethyl Bromide is 101·3° F. (38·5° C.).

Boiling point of a sample sp. gr. 1·45 was 38·5° C. (101° F.), and dissolved in 120 parts of Water.

It should give no reaction with pure Sulphuric Acid, or no more than a yellow colour after an hour, indicating the absence of organic Sulphur compounds, Amyl and Ethylene compounds. When evaporated should leave no residue, indicating the absence of fixed residue. When shaken with an equal volume of Water it should be a little, if anything, decreased in volume, indicating the absence of more than a trace of Alcohol, and when the aqueous layer is separated it should not be acid in reaction towards Litmus paper, nor should an immediate turbidity be produced on the addition of a few drops of Silver Nitrate Solution, indicating the absence of Hydrobromic Acid, etc. When 1 c.c. of Ethyl Bromide is warmed with 3 drops of Aniline and 2 c.c. of Alcoholic Potassium Hydroxide Solution the characteristic odour of Carbylamine should not be evolved, indicating the absence of Chloroform. Its vapour should have a pleasant ethereal odour.

ÆTHYLENE BROMIDE, $C_2H_4Br_2$.—A heavy, colourless, somewhat volatile liquid, obtained from the hydrocarbon Ethylene. Boils at 264·2° F. (129° C.), sp. gr. 2·17. Given in epilepsy.

Dose.—1 to 2 minims = 0·06 to 0·13 c.c., dissolved in oil.

Not Official.

ÆTHYL CHLORIDUM.

ETHYL CHLORIDE. HYDROCHLORIC OR MURIATIC ETHER.

FR., CHLORURE D'ETHYLE; GER., CHLORÄTHYL; ITAL., CLORURO D'ETILE.

C_2H_5Cl, eq. 64·01.

A colourless, ethereal, inflammable liquid, which is supplied in glass capsules closed by a screw or spring cap.

It has a characteristic ethereal and somewhat agreeable odour and a sweetish burning taste.

It is produced by the action of Hydrochloric Acid gas on absolute Ethylic Alcohol.

On account of its highly inflammable and volatile nature it should be preserved in hermetically-sealed glass tubes, and should not be opened when near a naked flame.

Medicinal Properties.—Used for producing local anæsthesia in minor surgery and dentistry, and as an analgesic in neuralgic and rheumatic pains.—*T.G.* '93, 387; '94, 119. *See* also Methyl Chloride.

Description of an apparatus for administering volatile anæsthetic agents, such as bromide and chloride of ethyl. A mask which hermetically seals the mouth and nose of patient.—*L.* '02, ii. 49. Caution required in the use thereof; such volatile bodies are depressants, and their capacity for danger culminates when mouth and nose are hermetically sealed.—*L.* '02, ii. 171.

A few cases of ethyl chloride narcosis. Its use recommended in place of nitrous oxide gas.—*L.* '01, i. 699; '01, ii. 123. Treatment of lupus with ethyl chloride.—*B.M.J.E.* '01, i. 76; *T.G.* '01, 603.

Review of 450 cases in which it was used as a general anæsthetic, with no trouble during narcosis ascribable to the drug itself.—*L.* '03, i. 952.

A record of 100 successful administrations each of Ethyl Chloride and of Soemnoform alone, and in mixture with Nitrous Oxide. The dose was generally determined by the amount of operative work necessary in each individual case, the largest dose given being 6 c.c.—*L.* '05, ii. 1176. A dose of 5 c.c. may be trusted (*B.M.J.* '05, ii. 616) to give at least 5 minutes' anæsthesia in midwifery cases, and gives great command over uncontrollable pains at the end of the second stage.

As an anæsthetic for young children aged from 5 days old and upwards, it is regarded (*L.* '05, ii. 1542, 1922) as one of the best means of procuring an anæsthesia of from 5 to 15 minutes. A celluloid inhaler is used, and the dose employed for infants of a few days or a few weeks old is 3 c.c., for those of 6 months and upwards 5 c.c.

An examination recorded (*L.* '05, ii. 1631) of seven makes of this liquid obtainable in London showed that all the branded samples were pure, as was also one of the unbranded samples. One branded and one unbranded sample were found to contain traces of impurity, but the former was not intended for general anæsthesia. The boiling point of the pure product is 12·5° C. (54·5° F.). It should be free from Water, from foreign chlorides, from acids, from aldehydes, from Ether or Alcohol, and from organo-metallic substances.

The death of a patient (*L.* '06, i. 615; *B.M.J.* '06, i. 538) while under its influence for the purpose of having four teeth removed gave rise to considerable discussion regarding its safety. The statistics published (*B.M.J.* '06, i. 616) indicate that it is not so innocuous as previous collections appeared to indicate. The dangers seem formidable (*B.M.J.* '06, i. 1058), but should not blot out its undeniable advantages. It occupies a distinct place in the armamentarium of the anæsthetist; it conveniently and safely leads up to Ether narcosis and may take the place of Nitrous Oxide when this is not available, not efficacious, or unsatisfactory. The dose recommended is 2 or 3 c.c. for a child, 3 or 4 c.c. for a woman or weakly man, and 4 or 5 for a man. Minimal dosage and not too great deprivation of air when anæsthesia is complete are the patient's safeguards.

It is stated (*L.* '05, ii. 1026) to occupy a position as an anæsthetic midway between Nitrous Oxide and Ether. It is an ideal preliminary to etherisation, and more especially for great smokers, alcoholics, and nervous patients. Patients with obstructed breathing are regarded as bad subjects for its administration. Mixtures of Ethyl Chloride, Ethyl Bromide, etc., appear to possess no advantages.

Although in point of safety (*L.* '05, ii. 1922), Ethyl Chloride, when administered by skilled hands, as a general anæsthetic, comes between Ether and Chloroform, it is far from being an absolutely innocuous anæsthetic.

A record of twenty-two fatalities which have occurred under Ethyl Chloride. —*L.* '06, i. 1233.

A remarkable uniformity (*L.* '06, ii. 106) is noticed in the qualitative effects of Ethyl Bromide, Chloride, and Iodide. Their physiological action differs in degree only, depending simply on the volatility of the drugs. Their action on the circulatory system appears to be almost directly upon the heart.

Acid intoxication following Ethyl Chloride anæsthesia.—*L.* '08, i. 284.

Tests.—Sp. gr. 0·921 at 0° C. (32° F.). It is but slightly soluble in Water, but mixes in all proportions with Alcohol (90 p.c.), Chloroform, and Ether. It boils at 12° C. (53·6° F.). On ignition it burns with a green-edged, smoky flame producing Hydrochloric Acid gas. It should volatilise completely at ordinary temperatures without leaving a residue, and if allowed to evaporate from pure filter paper should leave no unpleasant odour. Its aqueous or alcoholic solution should have no acid reaction towards blue Litmus paper, nor should a turbidity be produced by the addition of Silver Nitrate Solution.

U.S.P. requires that no odour of Aldehyde shall be developed when the aqueous layer, which remains after shaking 10 c.c. of Ethyl Chloride with 10 c.c. of cold Water and spontaneously evaporating the Ethyl Chloride layer, is treated with Potassium Dichromate and diluted with Sulphuric Acid; indicating the absence of Alcohol.

Foreign Pharmacopœias.—Austr. (Aethylum Chloratum); Belg. and Swiss (Æther Chloratus); Dutch (Chloretum Aethylicum); Fr. (Chlorure d'Ethyle); Ital. (Cloruro d'Etile); U.S.

NARCOTILE (Methylene bi-chloride).—A transparent, colourless, mobile, highly volatile and inflammable liquid. Introduced as a new general anæsthetic. —*L.* '03, i. 1091.

SOEMNOFORM.—Stated to be a mixture of Ethyl Bromide 1, Ethyl Chloride 12, and Methyl Chloride, 7; a rapid, safe and easily eliminated anæsthetic for use in dentistry.—*L.* '03, ii. 635; *P.J.* '03, i. 872.

Two fatal cases have been recorded in connection with Soemnoform, and it is stated (*L.* '04, ii. 1408) that, although the mixture was employed for the object of testing its effect, its use was not likely to be repeated.

Kelene is a proprietary article stated to consist of pure Ethyl Chloride, and put up in tubes fitted with patented automatic stoppers. Useful for producing local anæsthesia. For general anæsthesia it is put up in graduated tubes.

Anæsthyl and **Coryl** are stated to be mixtures of Ethyl and Methyl Chlorides.

Not Official.

ÆTHYL IODIDUM.

ETHYL IODIDE. HYDRIODIC ETHER.

C_2H_5I, eq. 154·72.

A colourless, volatile, heavy and non-inflammable liquid, with an agreeable ethereal odour and pungent taste.

It is produced by the action of resublimed Iodine on pure Ethylic Alcohol in the presence of amorphous Phosphorus. The coloured product is freed from uncombined Iodine by shaking with a solution of Sodium Bisulphite and purified by digestion over fused Calcium Chloride and redistillation.

It should be kept in well-stoppered glass bottles of a dark amber tint and in a cool place.

It soon acquires a reddish-brown colour on exposure to light; but if no deeper than a pale wine colour it may be disregarded.

The change of colour can be prevented by putting in the bottle a globule of Mercury.

Solutions which have already become discoloured may be shaken with some finely-powdered Sodium Bisulphite, filtered and redistilled.

Solubility.—1 in 440 of Water, mixes in all proportions with Alcohol (90 p.c.).

Medicinal Properties.—Antispasmodic. It is used as an **inhalation**; 15 to 20 drops inhaled through the nose from a wide-mouthed bottle is more accurate and economical than dropping it on a handkerchief. It is said not to weaken the digestive organs but rather to have a tonic effect. It has been inhaled with success to relieve the dyspnœa in chronic bronchitis and asthma; also in secondary and tertiary syphilis as an adjunct to the administration of Potassium Iodide, the Iodine being very rapidly absorbed.—*Squibb; B.M.J.* '89, ii. 1216; *P.J.* (3) xix. 46.

Prescribing Note.—*Can be obtained in* **glass capsules,** 5 *minims* = 0·3 *c.c. in each.*

Foreign Pharmacopœias.—Mex. (Eter Yodhidrico). Not in the others.

Tests.—Sp. gr. at 15·5° C. (60° F.) 1·943. Boiling point 71° to 72° C. (159·8 to 161·6° F.). It should leave no residue upon evaporation. When shaken with an equal volume of Water and a little fuming Nitric Acid free Iodine is liberated, recognised by the reddish-brown colour produced. The aqueous layer remaining after shaking together equal volumes of Ethyl Iodide and Water shall yield no turbidity with Silver Nitrate Solution (absence of Hydriodic Acid).

Not Official.

AGARICUS ALBUS.

AGARIC OF THE LARCH. WHITE OR PURGING AGARIC.

A species of mushroom, found growing on old Larches in Southern and Central Europe.

Medicinal Properties.—Has been used with success in night sweating of phthisis, checking cough and promoting sleep; also in hæmoptysis. It has a strong cathartic action.—*Pr.* xxix. 321; *M.T.* '81, ii. 442; *T.G.* '88, 41, 371.

Dose.—5 to 30 grains = 0·32 to 2 grammes of the powder given in jam.

Foreign Pharmacopœias.—Official in Fr., Ital. (Agarico Bianco), Mex. (Agarico Blanco), Port. (Agarico Brancho), Span. and Swiss. Not in the others.

Descriptive Notes.—This fungus is not a true agaric, but belongs to the *Polyporei* in which the gills are replaced by slender tubes, giving a porous appearance to the under surface of the cap or pileus. The commercial article consists of the fleshy part or stroma of the fungus deprived of the brown-ringed white cuticle of the upper surface and, almost entirely, of the short tubular portion or hymenium of the lower surface. It grows on various species of Larch, from Central Europe to Siberia, chiefly on *Larix Sibirica*, Led., and comes to England *viâ* Hamburg. It varies in size from 3 to 8 inches (7·5 to 20 cm.) or more in diameter. It is whitish, spongy and friable. Although normally of the form of a rounded cone, it is often broken up into irregular pieces. The taste is sweetish at first and afterwards bitter and acrid, but it has no characteristic odour. It can be rubbed to powder in a sieve, but becomes flattened when pounded in a mortar. The active principle Agaricin is official in the *P.G.* Under the microscope the drug is seen to consist of slender hyphal threads, mixed with minute calcareous concretions.

AGARICIN (Agaricic Acid).—A white crystalline powder. Melts at 138° C. (280·4° F.).

Solubility.—1 in 140 of Alcohol (90 p.c.); practically insoluble in Water and in weak Alcohol.

Dose.—¼ to 1½ grains = 0·016 to 0·1 gramme. Generally given with Dover's Powder in a pill.

Ph. Ger. maximum single dose, 0·1 gramme.

It should not be given hypodermically.—*L.M.R.* '84, 118.

In pill form 1/12 grain very successful in night sweats of phthisis.—*T.G.* '94, 627.

Foreign Pharmacopœias.—Official in Dan., Ger., Ital., Jap., Mex. and Norw. Not in the others.

ALCOHOL ABSOLUTUM.

ABSOLUTE ALCOHOL.

Fr., Alcool Ethylique; Ger., Absoluter Alkohol; Ital., Alcool Assoluto; Span., Alcohol Anhidro.

A clear colourless, mobile, hygroscopic liquid, volatile and inflammable. It possesses a spirituous odour and a burning taste, and contains Ethyl Hydroxide, $\mathbf{C_2H_5OH}$, eq. 45·70, with not more than 1 p.c., by weight, of Water. It is obtained by the dehydration and rectification of Ethylic Alcohol of weaker strengths. It is possible to rectify Alcohol up to 98 p.c.; beyond this dehydrating agents are necessary.

On account of its hygroscopic nature and its inflammability it should be preserved in well-stoppered bottles in a cool place.

Foreign Pharmacopœias.—Official in Ital., sp. gr. 0·800; Span., sp. gr. 0·794; Dutch, sp. gr. 0·794 to 0·799; Austr., Belg., Dan., Ger. and Jap., sp. gr. 0·796 to 0·800; Fr., sp. gr. 0·79433; Swed., sp. gr. 0·7955 to 0·8005; Swiss, sp. gr. not higher than 0·796; Mex. (Alcohol Vinico), sp. gr. 0·790; U.S., sp. gr. not higher than 0·797 at 15·6° C. (60° F.); or 0·790 at 25° C. (77° F.). Not in the others.

Official Preparations.—Used in the preparation of Chloroform, Liquor Ethyl Nitritis, and Liquor Sodii Ethylatis.

ALCOHOL (90 p.c.).—This is described under the heading Spiritus Rectificatus, as are also the weaker strengths of Alcohol, which are prepared from it.

Tests.—The distinguishing tests for Absolute Alcohol are the sp. gr. which should be about 0·794, and the boiling point 78·5° C. (173·3° F.); the latter is not included in *B.P.* or *U.S.P.*; the *P.G.* gives 78·5° C. (173·3° F.).

The official figure for the sp. gr. is 0·794 to 0·796; the *U.S.P.* gives not higher than 0·797 at 15·6° C. (60° F.), or 0·790 at 25° C. (77° F.); the *P.G.* 0·796 to 0·800.

The more generally occurring impurities are excess of Water, extractive matter, substances of an oily or resinous nature, Amylic Alcohol, Fusel Oil, organic impurities, Aldehyde, and Tannic Acid. Absolute Alcohol is required to be neutral to blue Litmus paper by *U.S.* and *P.G.*, but *B.P.* makes no mention of its reaction.

B.P. uses 1 to 2 p.c. of anhydrous Copper Sulphate as a test for excess of Water, requiring that when mixed with this quantity of the reagent and shaken occasionally within 2 or 3 hours the salt shall not become decidedly blue, but *U.S.P.* relies upon the sp. gr. alone.

All three Pharmacopœias agree that no fixed residue shall be left upon evaporation, and that it shall mix with Water without any turbidity, indicating the absence of oily and resinous substances.

The *B.P.* and *U.S.P.* require that it shall leave no unpleasant or foreign odour when allowed to evaporate from clean filter paper, indicating the absence of Fusel Oil and allied impurities; the *P.G.* states that the Alcohol itself should possess no foreign odour.

The *B.P.* and *U.S.P.* differ in their method of testing for Amylic Alcohol, and in the quantities used for the test. *B.P.* indicates 100 c.c. of Absolute Alcohol and 2 c.c. of Volumetric Silver Nitrate Solution, decanting the supernatant liquid from the black precipitate formed during the first 24 hours' exposure to bright light, and requiring that the liquid shall undergo no further change when exposed to the light after the addition of more Volumetric Silver Nitrate Solution; *U.S.P.* employs 20 c.c. of Absolute Alcohol for the test and 1 c.c. of Silver Nitrate Test-solution, stipulating that no more than a faint opalescence nor more than a faint brownish tint shall be acquired when exposed for six hours to diffused daylight. The *P.G.* employs 10 c.c. of the Alcohol and 5 drops of Silver Nitrate Solution, requiring that it shall neither become turbid nor coloured on warming. The *P.G.* includes a test for Fusel Oil by evaporating a mixture of 10 c.c. of Absolute Alcohol and 0·2 c.c. Potassium Hydroxide Solution (15 p.c. w/w) to one-tenth its volume, and supersaturating the residue with Sulphuric Acid; when no odour of Fusel Oil should be developed.

The *P.G.* performs the test for readily carbonisable organic impurities on the Absolute Alcohol direct, without evaporation, but *U.S.P.* directs the spontaneous evaporation of the Alcohol (carefully protecting the liquid from dust during the evaporation) and the application of a few drops of colourless Sulphuric Acid to the residue. Both Pharmacopœias require that no red coloration should be produced.

U.S.P. and *P.G.* give practically the same test for limit of Aldehyde.

The Ammonia test for Tannic Acid and excess of Aldehyde is common to *B.P.* and *P.G.*, but is omitted from *U.S.P.* The *B.P.* requires that no immediate coloration shall be produced on the addition of Ammonia Solution; the *P.G.* that no coloration shall be yielded on the addition of Ammonia Solution.

The *U.S.P.* includes a test for the absence of not more than 2 p.c. of Methyl Alcohol which does not appear in either *B.P.* or *P.G.* It depends upon the oxidation of the Methyl Alcohol by means of Copper wire, and a test for Formaldehyde in the oxidised liquid by the Resorcin test. The Acetaldehyde produced by the oxidation of the Ethylic Alcohol is previously removed by boiling. The test is given in the small type under Spiritus Rectificatus, under the heading of Copper Wire and Resorcin.

The *P.G.* requires that the red coloration produced in a mixture of 10 c.c. of Absolute Alcohol and 1 c.c. of Potassium Permanganate Solution (0·1 p.c. w/w), shall not change to yellow within 20 minutes; the test is intended to detect the presence of Aldehyde or Formic Acid, Fusel Oil and other organic impurities. This latter Pharmacopœia also requires that Absolute Alcohol shall not be coloured by Hydrogen Sulphide Solution, indicating the absence of Copper and Lead.

Except so far as strength is concerned, both *B.P.* and *U.S.P.* require Absolute Alcohol to respond to the respective tests given under 'Spiritus Rectificatus.'

Not Official.

ALCOHOL METHYLICUM.

METHYLIC ALCOHOL.

Syn.—RECTIFIED PYROXYLIC SPIRIT.

A colourless liquid, with a peculiar spirituous odour, and which has been submitted to various processes of rectification. It is produced by the destructive distillation of wood.

Its vapour forms explosive mixtures with air, and as it is very volatile it should be kept in well-stoppered bottles and in a cool atmosphere.

Solubility.—It mixes readily with Water, Ethylic Alcohol, Chloroform, and Ether. It dissolves Fats and volatile Oils.

Medicinal Properties.—Narcotic, sedative, and anti-emetic. It palliates the cough and lessens the febrile excitement of phthisis. It has been mixed with Chloroform for use as an anæsthetic (Regnauld's Anæsthetic Mixture). *See* CHLOROFORM.

In cases of poisoning, the use of the stomach-pump and rectal injections are recommended (*B.M.J.* '05, i. 262) to get rid of the poison. Stimulants and application of heat to the body and extremities. The treatment of the amaurosis is unsatisfactory. In the early stages, Pilocarpine and Potassium Iodide are indicated, and in the later stages Strychnine hypodermically or by the mouth.

The deodorised product has received considerable attention on account of its poisonous properties. Injected in small and continuous doses, its effect is far more deadly than grain Alcohol. The fumes are a distinct menace to eyesight and general health, and its external use is also objected to.—*L.* '04, ii. 1255.

Tests.—Sp. gr. about 0·803. Boiling point about 55° to 66·5° C. (131° to 151·7° F.). It should be without action on Litmus paper, and should not be rendered turbid by admixture with Water. It should leave no empyreumatic odour on evaporation, and should be free from fixed residue. It should yield little or no reaction for Iodoform when tested with Potassium Hydroxide Solution and Iodine (absence of Acetone).

Dose.—5 to 10 minims = 0·3 to 0·6 c.c.

Wood Spirit, Wood Naphtha, Pyroxylic Spirit are names applied to the crude article of commerce, which may contain from 75 to 90 p.c. of real Methylic Alcohol.

METHYLATED SPIRIT.—*See* SPIRITUS METHYLATUS.

METHYLIC ETHER.—It is gaseous at ordinary temperatures, but is condensed by cold and pressure to a liquid boiling at −20° C. (−4° F.). A solution of this in Ethylic Ether is useful for producing local anæsthesia.

Not Official.

ALETRIS.

STAR GRASS. COLIC ROOT.

A perennial plant indigenous to U.S. The root was formerly included in the U.S. secondary list. It is stated to be useful as a uterine tonic, and has been employed with asserted benefit in colic, dropsy, and in chronic rheumatism.

Descriptive Notes.—The rhizome occurs in pieces about 1 to 2 inches (25 to 50 mm.) long, rarely branched, ⅙ to ½ inch (4 to 12·5 mm.) in diameter, compressed, covered with the brownish-grey scaly remains of leaves, and root-fibres, so that its outer surface is hidden. The transverse section is yellowish-white, spongy and porous, exhibiting here and there glistening points. The taste is mucilaginous and then bitter. It contains much starch, and unless kept in a bottle it is liable to be attacked by insects. It is derived from *Aletris farinosa*, L., and belongs to the nat. ord. Hæmodoraceæ.

EXTRACTUM ALETRIDIS LIQUIDUM.—A 1 in 1 fluid extract of the rhizome prepared by percolation. The Alcohol is removed by distillation from the last portion of the percolate, the residue is dissolved in the reserved portion, and sufficient of the menstruum (Alcohol 45 p.c.) added to produce the required volume.—*B.P.C. Formulary* 1901.

This has been incorporated in the *B.P.C.*

ELIXIR ALETRIDIS.—Fluid Extract of Aletridis, 1; Fluid Extract of Liquorice, ¼; Tincture of Orange, ¼; Syrup, 1½; Distilled Water, to yield 4.—*B.P.C. Formulary* 1901.

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

Elixir Aletridis.—Liquid Extract of Aletris, 25; Liquid Extract of Liquorice, 6; Simple Elixir, 45; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

ALOES.

Fr., Aloes; Ger., Aloe; Ital., Aloe; Span., Acibar.

Both Aloe Barbadensis and Aloe Socotrina are official in *B.P.* and *U.S.P.* *P.G.* has the African varieties only. *See* below.

Medicinal Properties.—Bitter tonic, purgative, acting chiefly on the large intestine; the slowest of purgatives, taking ten to fifteen hours to act. Stomachic bitter in very small doses. A good tonic cathartic in habitual constipation and in that associated with amenorrhœa and anæmia. Emmenagogue; should not be given during advanced pregnancy nor in inflammatory conditions of the pelvic organs. Small doses relieve, large doses aggravate hæmorrhoids. Used as an enema it is anthelmintic.

The aqueous extract is more active than is the resinous portion of Aloes, and the Barbados Aloes, containing a larger amount of aqueous extract than the Socotrine, is the more purgative; thus, 2 grains are equal to 3 grains of Socotrine.

Dose.—2 to 5 grains = 0·13 to 0·32 gramme.

Prescribing Notes.—*Can be made into pills with a small quantity of diluted Alcohol; rarely prescribed alone.*

1 *grain with* ⅓ *grain Extract of Nux Vomica, is an excellent pill to obtain the stomachic effect, and to relieve habitual constipation. The Pilula Aloes et Ferri, and Pilula Aloes et Myrrhæ are given in amenorrhœa associated with chronic dyspepsia and constipation.*

Official Preparations.—Of **Barbados Aloes,** Extractum Aloes Barbadensis, Pilula Aloes Barbadensis, Pilula Aloes et Ferri. Contained in Pilula Cambogiæ Composita, Pilula Colocynthidis Composita, and Pilula Colocynthidis et Hyoscyami. Used in the preparation of Aloinum. Of the **Extract,** Decoctum Aloes Compositum, Extractum Colocynthidis Compositum, Tinctura Aloes. Of **Socotrine Aloes,** Pilula Aloes et Asafetidæ, Pilula Aloes et Myrrhæ, Pilula Aloes Socotrinæ. Contained in Pilula Rhei Composita, Tinctura Benzoini Composita. Also used in the preparation of Aloinum.

Not Official.—Aloe Capensis, Decoctum Aloes Compositum 'Squire,' Enema Aloes, Pilula Aloes Diluta, Pilula Aloes et Belladonnæ, Pilula Aloes et

Nucis Vomicæ, Pilula Aloes Composita, Pilula Aloes et Myrrhæ, Pilulæ Aperientes Stahlii, Pilulæ Guttæ Aloeticæ, Pilula Laxativæ Composita, Pulvis Aloes et Canellæ, Tinctura Aloes Composita, Tinctura Aloes et Myrrhæ, and Vinum Aloes.

The distinguishing tests for Barbados and Socotrine Aloes will be found under their official headings. The African varieties are official in the *P.G.*, and the Descriptive Notes and Tests are given here.

South African Aloes is the evaporated juice of the leaves of the African varieties of the genus 'Aloe,' and forms a dark brown mass possessing a characteristic odour and bitter taste. It easily breaks into large pieces with a conchoidal fracture and sharp-edged reddish splinters which are translucent and of a reddish or light brown tint, but do not possess any crystalline character under the microscope.

Descriptive Notes.—There are three forms of Aloes imported from British South Africa. First, the vitreous blackish Aloes with a conchoidal fracture, and greenish-brown translucent splinters, commonly known in this country as Cape Aloes, which give the reactions described in the *P.G.* Second, an opaque or 'Hepatic' Cape Aloes, giving an orange brown powder, imported of recent years from Mossel Bay under the name of 'Uganda' Aloes, and manufactured from the leaves of *Aloe ferox*, L., and dried by sun heat alone, in the form of square bricks about four inches square and one inch thick. Third, an opaque Aloes very brittle and giving a pale greenish-brown powder. It is rarely imported, and comes from Port Natal, but is remarkable for giving a permanent crimson colour with Nitric Acid and a bluish colour when Sulphuric Acid is added to it and the vapour of Nitric Acid blown over the mixture. It should perhaps be called Hepatic Natal Aloes, since a translucent Aloes is also prepared from *Aloe platylepis*, J. G. Baker, near Pietermaritzburg in Natal, and usually passes in commerce for Cape Aloes and gives the same chemical reaction as that prepared from *Aloe ferox*, L. The botanical source of Hepatic Natal Aloes is unknown.

Tests.—The distinguishing test for African Aloes is that if a particle be treated with Nitric Acid no red but only a pale greenish zone shall be formed within three minutes (differing thus from Barbados Aloes).

About 40 p.c. should be soluble in cold Water, and it should be completely soluble 1 in 5 (by weight) of warm Alcohol (90 p.c.), the solution remaining clear even after cooling.

5 parts of Aloes treated with 60 parts of boiling Water should yield an almost clear solution, from which about 3 parts again separate on cooling, *P.G.*

Aloes dissolved in hot Water produces with Concentrated Solution of Borax a greenish fluorescence, *P.G.*

It should impart to boiling Chloroform and Ether only a very faint yellow colour, and Ether so coloured should leave only a very slight residue, *P.G.*

Thoroughly dried Aloes is used for the preparation of Powdered Aloes. The powder should not agglutinate at 100° C. (212° F.) nor alter in colour, *P.G.*

ALOE BARBADENSIS. BARBADOS ALOES.

FR., ALOES DES BARBADES; GER., BARBADOS ALOE; ITAL., ALOE VERA; SPAN., ACIBAR BARBADO.

They are obtained principally from the leaves of *Aloe vera*, L., and *Aloe chinensis*, Steud., in the West Indian Islands, and sold as Barbados or Curaçao Aloes.

Solubility.—Water dissolves about 75 p.c. It is almost entirely soluble in Alcohol (60 p.c.).

Dose.—2 to 5 grains = 0·13 to 0·32 gramme.

Foreign Pharmacopœias.—Official in Belg., Dutch, Fr., Ital., Jap., Port., Span. and U.S.; Mex. (Acibar). Not in the others.

Descriptive Notes.—Barbados or Curaçao Aloes as imported varies considerably in colour, consistence, and degree of opacity, and may be in the form of a stiff yellowish-brown paste, a mass of pitchy character, or hard and solid, but it always has a comparatively smooth surface; when dried it varies in colour from chocolate brown to black, or rarely exhibiting more or less translucent pieces, which become opaque on keeping. It has a characteristic somewhat nauseous odour, more evident when freshly broken, or powdered, and a very bitter taste. The best qualities conform to the requirements as to solubility given under Tests. Such Aloes as present a chocolate brown colour and freedom from air vesicles are of the finest quality and should be chosen for medicinal use, these characters indicating evaporation of the fresh, not fermented, juice by steam heat, black vesicular samples being of inferior quality, prepared from fermented juice and evaporated over a naked fire.

Aloes are now rarely imported from Barbados, and then only in small quantity, coming almost exclusively from the Dutch West Indian Islands of Curaçao, Bonaire, and Aruba.

Tests.—The distinguishing test for Barbados Aloes is the crimson colour imparted to Nitric Acid by the powder.

The more generally occurring impurity is an undue amount of insoluble matter. This is guarded against by the requirement that not less than 70 p.c. shall be soluble in Water, and that it should be almost entirely soluble in a mixture containing Alcohol (90 p.c.) diluted with half its volume of Water.

Barbados Aloes yields about 2 p.c. of ash, and 3 p.c. should not be exceeded.

1. **Borntrager's test.**—Shake out with Benzene, and treat separated Benzene with Ammonia; pink colour on standing.

2. **Klunge's test.**—Warm with Copper Sulphate and a little Sodium Chloride; yellow colour, changing to red or violet. Fair test for West Indian Aloes, but not much good for the other varieties.

3. **Fluckiger's test.**—Sulphuric Acid and Nitric Acid Vapour; deep blue colour. Specific test for Natal Aloes.

3. **Bainbridge's test.**—Nitric Acid; red colour, changing to green. Distinguishes it from Cape Aloes.

5. **Cripp's and Dymond's test.**—Triturate 1 grain of sample with 16 drops Sulphuric Acid, add 4 drops Nitric Acid and dilute with an oz. of Water. A deep orange to crimson colour is developed, intensified by the addition of Ammonia. This appears to be the best general test for Aloes.—*P.J.* (3) xv. 633. The reaction is also given by all bodies containing or yielding Chrysophanic Acid, but these yield a pink colour with Ammonia alone while Aloes only gives a pale yellow.

ALOE SOCOTRINA. Socotrine Aloes.

Fr., Aloes Socotrin; Ger., Socotrinische Aloe; Ital., Aloe di Socotora; Span., Acibar Sucotrino.

Socotrine or Zanzibar Aloes, obtained from *Aloe Perryi*, J. G. Baker, and possibly other species. Imported principally through Bombay.

Solubility.—Water dissolves about 50 p.c.; the residue is pretty well inert; almost entirely soluble in Alcohol (60 p.c.).

Dose.—2 to 5 grains = 0·13 to 0·32 gramme.

Foreign Pharmacopœias.—Official in Belg., Ital., Mex., Port., Span. and U.S.; U.S. has also Aloe Purificata, which is Socotrine Aloes dissolved in Alcohol, strained and evaporated to dryness. Cape Aloes is official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Norw., Port., Russ., Span., Swed. and Swiss.

Descriptive Notes.—Socotrine Aloes is usually imported in barrels, in a semi-liquid or pasty condition, and sometimes in a fermented or more or less fetid state. When dried it presents an extractiform or irregular surface, is opaque, and if of good quality is of a dark brown colour and gives an orange-brown powder. It possesses a not unpleasant odour. Inferior qualities are black and vesicular and have a rancid or butyric odour, and are unfit for medicinal use. Zanzibar Aloes is imported in skins, containing several pounds, packed in rectangular cases. It is usually of better quality than the Socotrine Aloes, and is commonly sold as 'Hepatic' Aloes, the opaque fractured surface being of a liver colour. Samples of which the splinters are garnet red and translucent are now rarely met with in either the Socotrine or Zanzibar varieties. These Aloes should conform to the requirements as to solubility given under Tests, and also the reactions with Nitric Acid. An East African Aloes met with in commerce is sold as Socotrine which does give a crimson colour with Nitric Acid, and therefore is excluded by the *B.P.* test, whilst its geographical source prevents its inclusion under Barbados Aloes; this kind exhales a faint odour like that of Curaçao Aloes, when freshly broken or powdered. There is also an Aloes, which comes *viâ* Bombay, from Jafferabad and other parts on the Arabian coasts, which does not give a crimson colour with Nitric Acid, but this kind yields a powder of a dull brown, not of an orange-brown colour like the Zanzibar and Socotrine Aloes, and possesses hardly any odour. The official description does not exclude Jafferabad Aloes, except in so far as that name is not used.

Tests.—The distinguishing test for Socotrine Aloes is the reddish or yellowish-brown colour produced when the powder is treated with a drop or two of Nitric Acid.

The more generally occurring impurities are leaves of *Calotropis* and stones, and an undue proportion of insoluble matter; but the opaque Natal Aloes might be mistaken for it, although its powder has a greenish-brown hue, not the orange-brown tint of Socotrine and Hepatic Aloes. The distinction of Barbados Aloes from Natal Aloes is ensured by the official requirement that no blue coloration shall be produced when the vapour of Nitric Acid is blown over the powder, previously moistened with Sulphuric Acid; the absence of the other impurities by the fact that *B.P.* requires about 50 p.c. to be soluble in Water, and that it should be almost entirely soluble in a mixture of Alcohol (90 p.c.) with half its volume of Water. The *U.S.P.* fixes a standard for moisture, which should not exceed 10 p.c.

Socotrine Aloes yields about 2 p.c. of ash, and 3 p.c. should not be exceeded.

ALOINUM. Aloin. $C_{16}H_{16}O_7$, $3H_2O$, eq. 371·36.

A yellow crystalline powder possessing a faint odour of Aloes and a very bitter taste. It is a neutral, non-glucosidal, bitter principle, obtained chiefly from Barbados Aloes.

It may be assumed that commercial 'Aloin' is α-Barbaloin. Its formula is $C_{16}H_{16}O_7$, with about three molecules of Water of crystallisation.

Solubility.—1 in 120 of Water; 1 in 18 of Alcohol (90 p.c.); freely soluble in hot Water; nearly insoluble in Ether.

B.P. states sparingly soluble in cold Water; *U.S.P.* gave the figure as 1 in about 65 at 25° C. (77° F.), but this was subsequently altered in the list of corrections and additions to 1 in 120; 3 samples obtained (1903) from different manufacturers yielded a solution at 1 in 120.

Dose.—½ to 2 grains = 0·03 to 0·13 gramme.

Prescribing Note.—*Generally given in* **pills** *or in* **cachets** *with other ingredients. 'Diluted Glucose' is a good excipient for Aloin in pills.*

Not Official.—Pilula Aloini Composita, Pilula Aloini et Podophylli.

Foreign Pharmacopœias.—Official in U.S. Not in the others.

Aloins may be classified as follows:—

BARBALOINS.—Yielding on oxidation Chrysammic, Aloetic, and Picric Acid.

- α-**barbaloin,** which gives a red colour with *cold* Nitric Acid (1·42), obtained from Barbados and Curaçao Aloes.
- β-**barbaloin,** which requires either fuming Nitric Acid, or a *hot* Acid of ordinary strength to give the *red* coloration. This variety is yielded by Jafferabad, and by some varieties of Socotrine and Zanzibar Aloes, *see* p. 119.

NATALOIN.—Yields on oxidation Picric but not Chrysammic Acid. This is a distinct species, from Natal Aloes only, having a formula $C_{24}H_{26}O_{10}$. H_2O. Softens at 180° C., and melts at 210° C.

Tests.—The distinguishing tests for Barbaloin are its melting point, which, when anhydrous, should be 147° C. (296·6° F.), and the red coloration produced on the addition of Nitric Acid. Both *U.S.P.* and *B.P.* state that Aloin is rapidly affected in alkaline solutions, but only slowly in neutral or acidified solutions.

B.P. gives no tests for impurities, but those more generally occurring are mineral residue, Aloins derived from Natal or Cape Aloes, and Emodin. Mineral matter is detected by the ash left on ignition, whilst Emodin is detected by treating the 10 p.c. Benzene Solution with an equal volume of 5 p.c. Ammonia Water. It should leave no weighable residue when ignited with free access of air. In testing for Emodin a weighed quantity of Aloin is shaken with 10 c.c. of Benzin for 1 minute and filtered, the filtrate should not impart more than a faint pink colour to an equal volume of Ammonia Solution (5 p.c.) when shaken with it. Its distinction from Nataloin, Socaloin and Capaloin is carried out by the colour tests mentioned below.

Colour reactions of the *U.S.P.* (*a*) The solutions in Ammonia and the Alkalis are yellow, turning red, with a greenish-red fluorescence. (*b*) Nitric Acid gives with Curaçao Aloin a cherry-red solution (distinction from Nat. Soc.

and Capaloins). (*c*) Sulphuric Acid with a minute quantity of Aloin forms a yellowish-red solution, which with a small crystal of Potassium Dichromate added becomes olive green, then dark green, and finally blue on standing; with a larger amount of Potassium Dichromate, the yellowish-red solution first turns purple, then brown, and finally green. (*d*) Bromine Water colours an aqueous solution pink. (*e*) Gold Chloride T.S. to carmine-red, turning to violet. (*f*) Ferric Chloride T.S. with an alcoholic solution gives a brownish-green colour. (*g*) Copper Sulphate T.S. gives with a dilute aqueous solution of Curaçao Aloin a bright yellow colour, this mixture with a few drops concentrated solution of Sodium Chloride gives a red colour, and on further adding a little Alcohol the colour becomes violet (distinction from Nataloin and Capaloin).

Preparations.

DECOCTUM ALOES COMPOSITUM. Compound Decoction of Aloes. *N.O.Syn.*—Baume de Vie.

An aqueous solution prepared by boiling together for five minutes Extract of Barbados Aloes 1, Myrrh ½, Potassium Carbonate ½, Extract of Liquorice 4, and Distilled Water 40. Immediately after the boiling is finished add Saffron ½, and, when the liquid has cooled down, Compound Tincture of Cardamoms 30, and more Distilled Water to make 100 of product. (1 of Extract in 100)

Dose.—½ to 2 fl. oz. = 14·2 to 56·8 c.c.

Tests.—Decoction of Aloes, *B.P.*, has a specific gravity of about 1·005, contains about 5·5 p.c. w/v of total solids and about 20 p.c. w/v of Absolute Alcohol.

DECOCTUM ALOES COMPOSITUM 'SQUIRE.' Made with Socotrine Aloes and the Fluid Extract of Liquorice.

Dose.—½ to 2 fl. oz. = 14·2 to 56·8 c.c.

The fluid extract is much better than the solid extract for covering the taste of Aloes; there is a marked difference in the taste of the two preparations, even when they practically contain the same amount of Liquorice. This suggestion has been adopted in *B.P.* in the case of Tincture of Aloes, but not in that of the Compound Decoction where it is of more importance.

Tests.—Squire's Decoction of Aloes has a specific gravity of about 1·009; it contains about 10 p.c. w/v of total solids and about 22 p.c. w/v of Absolute Alcohol.

EXTRACTUM ALOES BARBADENSIS.—Extract of Barbados Aloes.

An aqueous Extract, of which about ¾ grain is equal to 1 grain of the Aloes.

Dose.—1 to 4 grains = 0·06 to 0·26 gramme.

Foreign Pharmacopœias.—Extract of Aloes is Official in Austr., Dan., Dutch, Ger., Hung., Ital., Jap., Norw., Russ., Swed., Swiss and U.S. Not in the others.

PILULA ALOES BARBADENSIS. Pill of Barbados Aloes.

4 of the pill is about equal to 2 of Barbados Aloes, 1 of Hard Soap, ⅛ of Oil of Caraway, and 1 of Confection of Roses.

Dose.—4 to 8 grains = 0·26 to 0·52 gramme.

PILULA ALOES SOCOTRINÆ. PILL OF SOCOTRINE ALOES.

4 of the pill is about equal to 2 of Socotrine Aloes, 1 of Hard Soap, ⅛ of Oil of Nutmeg, and 1 of Confection of Roses.

Dose.—4 to 8 grains = 0·26 to 0·52 gramme.

Foreign Pharmacopœias.—Official in Fr. (Pilules d'Aloes et de Savon), Jap. and U.S. (Pilulæ Aloes), Aloes and Soap, equal parts; Mex. (Pildoras de Acibar), Aloes 10, Soap 2; Swiss (Pilulæ Aloeticæ), Aloes 10, Soap 1, Glycerin 8 drops, Spirit *q.s.* Not in the others.

PILULA ALOES ET ASAFETIDÆ. PILL OF ALOES AND ASAFETIDA.

4 of the pill is about equal to 1 of Socotrine Aloes, 1 of Asafetida, 1 of Hard Soap, and 1 of Confection of Roses.

Dose.—4 to 8 grains = 0·26 to 0·52 gramme.

Foreign Pharmacopœias.—Official in U.S., 1 in 3; Jap., equal parts of Aloes, Asafetida, Soap and Honey. Not in the others.

PILULA ALOES ET FERRI. PILL OF ALOES AND IRON.

4½ of the pill is about equal to 1 of Barbados Aloes, ½ of Exsiccated Ferrous Sulphate, 1½ of Compound Powder of Cinnamon, and 1½ (by weight) of Syrup of Glucose.

Dose.—4 to 8 grains = 0·26 to 0·52 gramme.

Foreign Pharmacopœias.—Official in U.S., Purified Socotrine Aloes 1, Exsiccated Ferrous Sulphate 1, Aromatic Powder 1, Confection of Roses *q.s.*; Ger., Cape Aloes 1, Exsiccated Ferrous Sulphate 1, Sp. Saponis *q.s.*; Jap., equal parts of Aloes and Spirit *q.s.*; Swiss, Aloes 5, Ferrous Sulphate 5, Soap 1, Glycerin 5 drops, Alcohol *q.s.* Not in the others.

PILULA ALOES ET MYRRHÆ. PILL OF ALOES AND MYRRH.

4½ of the pill is about equal to 2 of Socotrine Aloes, 1 of Myrrh, and 1½ (by weight) of Syrup of Glucose.

The composition of this pill, known also as Pil. Rufi, remained much the same for about 300 years, but in 1898 the *B.P.* omitted the Saffron, the proportions of Aloes and Myrrh remaining the same.

Dose.—4 to 8 grains = 0·26 to 0·52 gramme.

Foreign Pharmacopœias.—Official in Port. and U.S., with Aromatic Powder in place of Saffron, Purified Aloes 13, Myrrh 6, Aromatic Powder 4, in grammes, Syrup *q.s.* to make 100 pills. Not in the others.

TINCTURA ALOES. TINCTURE OF ALOES.

Extract of Aloes, 1; Liquid Extract of Liquorice, 6; Alcohol (45 p.c.), *q.s.* to make 40. (1 Extract in 40)

Dose.—1½ to 2 fl. drm. = 5·4 to 7·1 c.c.; when repeated, ½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Belg., 1 in 5; Dutch, Fr., Ger., Ital., Jap., Russ., Span., Swiss, 1 and 5; Hung. and Port., 15 in 100; U.S., 1 in 10. All are by weight, except U.S.

Tests.—Tincture of Aloes has a sp. gr. of 0·970 to 0·980; it contains from 7 to 8 p.c. w/v of total solids and about 40 p.c. w/v of Absolute Alcohol.

Not Official.

ALOE CAPENSIS (Cape Aloes).—A translucent variety. *See* p. 117.

Official in all the Foreign Pharmacopœias.

DECOCTUM ALOES COMPOSITUM 'SQUIRE.'—*See* p. 121.

ENEMA ALOES.- Aloes 40 grains, Carbonate of Potassium 15 grains, Mucilage of Starch 10 fl. oz.—*B.P.* 1885.

Aloes 0·75, Potassium Carbonate 0·25, Glycerin 10, Mucilage of Starch *q.s.* to produce 100.—*B.P.C.*

PILULA ALOES DILUTA.—Marshall Hall's Pill. Barbados Aloes 4, dissolve in Water and strain; then add Extract of Liquorice 4, Treacle 4, thinly sliced Hard Soap 4; mix and evaporate to a pilular consistence.

Dose.—3 or 4 grains = 0·2 or 0·26 gramme.

This has been incorporated in the *B.P.C.* as a 4-grain pill.

PILULA ALOES ET BELLADONNÆ.—Extract of Aloes, 1 grain; Extract of Belladonna, ¼ grain.

PILULA ALOES ET NUCIS VOMICÆ.—Extract of Aloes, 1 grain; Extract of Nux Vomica, ¼ grain.

Barbados Aloes, 2 grains; Extract of Nux Vomica, ¼ grain; Alcoholic Extract of Belladonna, ¼ grain; in each pill.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*, using Alcohol (60 p.c.) as an excipient.

PILULA ALOINI COMPOSITA.—Aloini, Extract Nucis Vomicæ, Ferri Sulphatis, Pulv. Myrrhæ, Saponis, ana ½ grain.—*L.* '87, i. 2. (Sir Andrew Clark's Liver Pill.)

This has been incorporated in the *B.P.C.*

PILULÆ APERIENTES STAHLII (*Swed.*).—Extract Aloes, 6; Extract Rhei Co., 3; Reduced Iron, 2; Rad. Althææ, 2; Alcohol (64 p.c.) and Simple Syrup, *q.s.* to make 100 pills.

PILULÆ ALOES COMPOSITÆ. *Syn.* BAIRD'S PILLS.—Barbados Aloes, in powder, 30; Ipecacuanha Root, in powder, 6; Scammony, 30; Green Extract of Hyoscyamus, 30; Syrup of Glucose, *q.s.*; in 100 parts. Mix to form a mass and divide into pills weighing 4 grains each.—*P.J.F.* and *B.P.C.*

Dr. Mair's Pills.—Ipecacuanha Powder, 25 grains; Scammony, in powder, 2 drm.; Extract of Aloes, 2 drm.; Extract of Hyoscyamus, 2 drm.; make a mass and divide into 5-grain pills.—*Pharm. Form.*

Aloes Pilulæ Composita.—*Belg.*, Aloes 10, Scammony 3, Jalap 3, Ginger 4, Soap 10; *Ital.*, Aloes 3, Jalap 3, Soap 3.

Pilulæ Aloes et Jalap.—Equal parts of Aloes, Jalap, Soap and Liquorice. —*Jap.*

PILULÆ ALOES ET MASTICHES.—Purified Aloes, in fine powder, 13 grammes; Mastic, in fine powder, 4 grammes; Red Rose, in powder, 3 grammes; Alcohol (49 p.c.), *q.s.* to make 100 pills.—*U.S.P.*

Each pill will weigh about 3 grains. They are in imitation of Lady Webster's Dinner Pills, and one of them may be given as a laxative at bedtime or before a meal.

Barbados Aloes, in powder, 65; Mastic, in powder, 20; Confection of Roses, 15; in 100 parts. Divide into pills weighing 4 grains each.—*B.P.C.*

In Gray's Supplement these pills are given as 3 grains each.

PILULA ALOINI ET PODOPHYLLI COMPOSITA.—Aloin 2, Capsicin 1, Jalapin 2, Podophyllum Resin 4, Green Extract of Hyoscyamus 1, Extract of Nux Vomica 1; dose of the mass, ½ to 2 grains.—*P.J.F.*

Aloin 2, Oleoresin of Capsicum 1, Jalap Resin 2, Podophyllum Resin 3, Extract of Nux Vomica 1, Green Extract of Hyoscyamus 1; in 10 parts. Divide into pills weighing ½ grain each.—*B.P.C.*

Little Antibilious Pills.—Podophyllin, 8 grains; Aloin, 6 grains; Jalapin, 6 grains; Capsicin, 3 grains; Ipecacuanha Powder, 3 grains; Extract of

Hyoscyamus, 3 grains; Extract of Nux Vomica, 2½ grains; Glycerin Tragacanth, *q.s.* to make a mass. Divide into 60 pills.—*Pharm. Form.*

PILULÆ LAXATIVÆ COMPOSITÆ.—Aloin, 1·3; Strychnine, 0·05; Extract of Belladonna Leaves, 0·8; Ipecac., in powder, 0·4; Glycyrrhiza, 4·6, in grammes; Syrup, *q.s.* to make 100 pills.—*U.S.P.*

A modification of this has been incorporated in the *B.P.C.* as follows:—

Pilulæ Aloini et Strychninæ Compositæ.—Aloin, 50; Strychnine, 5; Green Extract of Belladonna, 25; Ipecacuanha, 12·50; Milk Sugar, *q.s.*; Syrup of Glucose, *q.s.*; in 100 parts; divide into ⅛-grain pills.—*B.P.C.*

PIL. GUTTÆ ALOETICÆ (*Swed.*).—Aloes, 7; Camboge, 3; Gum Arabic, 3; Galbanum, 4; Carvone, 1·5; Syrup, *q.s.* to make 100.

PULVIS ALOES ET CANELLÆ (Hiera Picra).—Powdered Socotrine Aloes, 4; Powdered Canella Bark, 1.

This has been incorporated in the *B.P.C.*

TINCTURA ALOES COMPOSITA. *Syn.* ELIXIR AD LONGAM VITAM.—*Ger.*—Aloes, in coarse powder, 3; Gentian, cut middling fine, 0·5; Rhubarb, cut middling fine, 0·5; Zedoary, cut middling fine, 0·5; Saffron, 0·5; Alcohol 70 p.c.), 100.

This has been incorporated in the *B.P.C.*, but with the Alcohol by volume instead of by weight.

Austr.—Aloes, 30; Gentian, 5; Rhubarb, 5; Zedoary, 5; Saffron, 5; Alcohol, (68 p.c.), 1000.

Fr.—Aloes, 25; Agaric, 2·5; Gentian, 2·5; Rhubarb, 2·5; Zedoary, 2·5; Saffron, 2·5; Alcohol (60 p.c.), 1000.

Ger. and *Jap.*—Aloes, 30; Gentian, 5; Rhubarb, 5; Zedoary, 5; Saffron, 5; Alcohol (68 p.c.), 1000.

Mex.—Aloes, 8; Gentian, 1; Rhubarb, 1; Saffron, 1; Agaric, 1; Treacle, 1; Alcohol (60 p.c.), 400.

Russ.—Aloes, 45; Gentian, 5; Rhubarb, 5; Saffron, 5; Alcohol (70 p.c.), 1000.

Swiss.—Aloes, 6; Saffron, 1; Agaric, 1; Myrrh, 1; Gentian, 1; Rhubarb, 1; Zedoary, 1; Alcohol (68 p.c.), 200.

All are by weight.

TINCTURA ALOES ET MYRRHÆ.—Purified Aloes, 1; Myrrh, 1; Powdered Liquorice Root, 1; Alcohol (94 p.c.), 75; and Water, 25, mixed *q.s.* to make 10.—*U.S.P.*

Socotrine Aloes, in powder, 10; Saffron, 5; Tincture of Myrrh, 100.—*Edin. Ph.* 1841. *Syn.* Elixir Proprietatis.—*P.L.* 1721; *B.P.C.*

VINUM ALOES.—Socotrine Aloes, 1½ oz.; Cardamom Seeds, bruised, 80 grains; Ginger, in coarse powder, 80 grains; Sherry, 2 pints.—*B.P.* 1885.

This has been incorporated in the *B.P.C.* as follows:—

Socotrine Aloes, crushed, 3·75; Cardamom Seeds, bruised, 0·50; Ginger, in coarse powder, 0·50; Sherry, sufficient to produce 100.

Not Official.

ALSTONIA.

The dried bark of *Alstonia Scholaris*, R. Br., and of *Alstonia Constricta*, F. Müll. **Infusum Alstoniæ** (1 *in* 20), dose ½ to 1 fl. oz. = 14·2 to 28·4 c.c.; and **Tincture Alstoniæ** (1 in 8), dose 30 to 60 minims = 1·8 to 3·6 c.c.; are official in *Ind.* and *Col. Add.* for India and the Australian and Eastern Colonies.

Not Official.

ALTHÆÆ RADIX.

MARSHMALLOW ROOT.

FR., GUIMAUVE; GER., EIBISCHWURZEL; ITAL., ALTEA; SPAN., ALTEA.

Descriptive Notes.—The root of the *Althæa officinalis*, Linn. Marshmallow root occurs in commerce in two forms, viz.:—(1) The natural root dried, and (2) the root with the outer bark removed. The former is usually sold by herbalists, the latter by pharmacists. The natural root bears some resemblance to Liquorice root, in its external characters, the surface having short transverse scars, the bark being tough and finely fibrous. It is, however, white internally (Liquorice is yellowish-white) and finely fibrous and has a mucilaginous instead of a sweet taste. The decorticated root is often larger than the natural root, and deeply grooved longitudinally. The larger decorticated roots are probably often derived from the allied species *A. Narbonensis*, L. Both are very mucilaginous. It is necessary to preserve the root in a dry place, or the syrup prepared from it will turn yellowish and have a disagreeable odour. Lozenges made of the powdered root with gum and flavoured with orange flower water are sold as Pastilles de Guimauve. The powder is also used in pill masses.

Medicinal Properties.—It is much employed on the Continent as a demulcent in irritation and inflammation of the mucous membranes of the mouth and pharynx.

Official in all the Foreign Pharmacopœias.

The two substances **Asparagin** and **Betain** have been extracted from Althæa root.

Asparagin dissolves Mercuric Oxide, but the Oxide must be freshly precipitated. A solution is best prepared by precipitating Mercuric Chloride Solution, washing the precipitated Oxide and dissolving it in solution of Asparagin. The solution has been employed as a hypodermic injection in the treatment of syphilis.

DECOCTUM ALTHÆÆ.—Althæa Root, 1; Water, 30; boil to 20.
This has been incorporated in the *B.P.C.*

SYRUPUS ALTHÆÆ.—Macerate 3 of Althæa Root in 40 of Water for twelve hours; strain, press, and filter until 32 have passed through; to this add 64 of Sugar, dissolve warm, and heat the Syrup to boiling; when cold, skim and strain through flannel.
This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in all except Belg., Fr. and U.S.

TROCHISCI ALTHÆÆ.—About 1 grain in each lozenge. Demulcent. Valuable after excision of tonsils or uvula.

Foreign Pharmacopœias.—Official in Ital., Mex. (Pastillas de Altea), Span. Not in the others.

ALUMEN.

ALUM.

$Al_2(SO_4)_3$, K_2SO_4, $24H_2O$, eq. 941·94.

$Al_2(SO_4)_3$, $(NH_4)_2SO_4$, $24H_2O$, eq. 900·16.

Fr., Alun de Potassium; Ger., Kalialaun; Ital., Solfato di Alluminio e di Potassio; Span., Sulfato Aluminico-Potasico.

Both salts are official; Potash Alum (Aluminium and Potassium Sulphate), and Ammonia Alum (Ammonium and Aluminium Sulphate). They are practically alike in appearance, occurring in large colourless octahedral crystalline masses, possessing a sweetish and very astringent taste.

Solubility.—1 in 11 of Water; 3 in 1 of boiling Water; Potash Alum, 1 in 3 of Glycerin; Ammonia Alum, 1 in 1¼ of Glycerin. Insoluble in Alcohol (90 p.c.).

Alum when heated melts in its own Water of crystallisation.

Medicinal Properties.—Astringent, used as a **gargle, mouth-wash,** or **spray** for tonsillitis, aphthous conditions of the mouth, and pharyngitis, 10 grains in 1 oz. of Water; as an **injection** in leucorrhœa and gonorrhœa, 60 grains in a pint of Water; as a **nasal douche** in chronic ozœna, 4 grains in 1 oz. of Water; as a **snuff** in epistaxis, 6 grains mixed with 1 grain of Starch; as a **lotion** in purulent ophthalmia, 2 to 6 grains in 1 oz. of Water. 10 to 15 grains three times a day have been given for internal hæmorrhage, such as that of typhoid or gastric ulcer, also for menorrhagia, and in cases of lead poisoning; arrests excessive secretion in dysentery, diarrhœa and night sweats; vomiting caused by the cough of phthisis is sometimes checked by 6 to 10-grain doses of Alum. A **saturated solution** in Water forms an excellent styptic for hæmorrhage of leech bites, bleeding hæmorrhoids, epistaxis, etc.; the **glycerin** of alum is used in inflamed tonsils. 60 grains have been recommended as an emetic in croup. Dried Alum is escharotic, used for warty growths and to stimulate indolent ulcers, and to destroy exuberant granulations and to remove nævi.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Prescribing Note.—*Mostly used in aqueous or Glycerin solution.*

Incompatibles.—Alkalis and their Carbonates, and Tannic Acid.

Official Preparations.—Glycerinum Aluminis, Alumen Exsiccatum.

Not Official.—Alum Rose Gargle, Gossypium Aluminis, Aluminium Acetate Solution, Aluminium Aceto-Tartrate, Aluminium Chloride, Aluminium Nitrate, Aluminium Naphthol-Sulphonate, Aluminium Oleate, and Aluminium Sulphate, Pessus Aluminis, Pessus Aluminis et Zinci, Pulvis pro Pedibus.

Foreign Pharmacopœias.—Official in Austr., Bel., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex. (Sulfato de Aluminio y Potassio), Norw., Port., Russ., Span. (Sulfato Aluminico-Potasico), Swed., Swiss and U.S. All of them use Potash Alum only.

Tests.—The distinguishing tests for Alum are that it shall yield, when dissolved in Water, a white gelatinous precipitate with Ammonia Solution, or with Potassium or Sodium Hydroxide Solution; the white precipitate produced by Ammonia Solution is practically insoluble in excess of the reagents, whilst that produced by solution of Potassium or Sodium Hydroxide dissolves and is again reprecipitated by sufficient Ammonium Chloride Solution, indicating the presence of Aluminium. When boiled with Potassium or Sodium Hydroxide Solution it evolves a strong ammoniacal odour, and the issuing gas has a strongly alkaline reaction towards moistened red Litmus paper, indicating the presence of Ammonia; or a saturated aqueous solution yields with Tartaric Acid Solution or Sodium Bitartrate Solution a white crystalline precipitate within half an hour, indicating the presence of Potassium. It yields a white precipitate, insoluble in Hydrochloric Acid, on the addition of Barium Chloride Solution, indicating the presence of Sulphates.

The more generally occurring impurities are Calcium, Copper, Iron and Lead.

The aqueous solution should, when faintly acidified with Hydrochloric Acid, be unaffected by Hydrogen Sulphide Solution, indicating the absence of Copper and Lead, and when this solution is rendered alkaline by the addition of a sufficient excess of Ammonia Solution it should not materially darken in colour, indicating the absence of more than traces of Iron. The *P.G.* and *U.S.P.* include a separate test for Iron which is given under the heading of Potassium Ferrocyanide Solution in the small type below; it should not afford a distinct turbidity on the addition of Ammonium Oxalate Solution, indicating the absence of more than traces of Calcium.

In *U.S.P.* and *P.G.* only the Potash Alum is official. The *U.S.P.* requires that it shall contain not less than 99·5 p.c. pure Aluminium Potassium Sulphate, and it shall lose 45·55 p.c. of its weight when all of its Water of crystallisation is driven off.

Potassium Ferrocyanide Solution.—20 c.c. of a solution (1-20) should not be coloured blue immediately by 0·5 c.c. Potassium Ferrocyanide T.S., *P.G.* and *U.S.P.*

Preparations.

GLYCERINUM ALUMINIS. Glycerin of Alum.

Powdered Alum, 1 oz.; Distilled Water, 3 fl. drm.; Glycerin, *q.s.* to make 6 oz. (1 in 6)

Pure Alum should and does dissolve clear in Glycerin, but commercial Pulv. Aluminis, as a general rule, will not dissolve without residue except after prolonged boiling.

A powerful local astringent. When diluted with Water it forms a useful gargle.

Sometimes prescribed with an equal quantity of Glycerin of Tannic Acid.

ALUMEN EXSICCATUM. Exsiccated Alum. *Syn.*—Alumen Ustum.

Potash Alum, deprived of its Water by heat. It yields about 55 p.c. of product.

Foreign Pharmacopœias.—Official in Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Norw., Port., Russ., Span., Swiss and U.S.

Not Official.

ALUM ROSE GARGLE.—Broken Rose petals, 3 drm.; Diluted Sulphuric Acid, 3 fl. drm.; cold Distilled Water, 10 fl. oz.; digest for two hours, and strain 8 fl. oz.; then add Alum, 2 drm.; Sugar, 4 drm.; Alcohol (90 p.c.), 4 fl. drm.; dissolve. This kept well for seven years. To be mixed with an equal bulk of Water before use.

Gargarisma Aluminis.—Alum, 2; Acid Infusion of Roses, *q.s.* to produce 100.—*B.P.C.*

GOSSYPIUM ALUMINIS.—Contains about 30 p.c. of Alum.

PESSUS ALUMINIS.—Alum, 15 grains; Oil of Theobroma, 2 drm.—*Westminster.*

This has been incorporated in the *B.P.C.*

PESSUS ALUMINIS ET ZINCI.—Exsiccated Alum, 5 grains; Zinc Sulphate, 5 grains; Opium, in powder, 1 grain; Basis, 60 grains.—*London.*

Alum, 5 grains; Zinc Sulphate, 5 grains; Basis, 120 grains.—*B.P.C.*

ALUMINIUM ACETATE SOLUTION (*Austr.*, *Belg.*, *Dutch*, *Ger.* and *Russ.*).—A clear colourless liquid, with an acid reaction and a faint odour of Acetic Acid; obtained by double decomposition between Aluminium Sulphate and Calcium Acetate. Sp. gr. 1·044 to 1·048. Contains 7½ to 8 p.c. Aluminium Acetate.

This has been incorporated in the *B.P.C.*

Swiss, sp. gr. 1·055 to 1·059. Contains 10 p.c.

It is also known as **Burow's Solution.**

A good antiseptic, preferred by some to Carbolic Acid for dressing lacerated wounds.

ALUMINIUM ACETO-TARTRATE.—Crystals soluble in their own weight of Water. **Official in** Dutch.

A powerful, non-poisonous antiseptic; also an astringent caustic.

A solution has been sold under the name **Alsol.**—*P.J.* '01, i. 665.

A solution containing 10 p.c. is official in Swiss.

30 to 60 grains in a pint of Water make a useful **gargle** or **douche.**

ALUMINIUM CHLORIDE.—A colourless, crystalline mass, giving off fumes of Hydrochloric Acid gas, and becoming damp on exposure to air. The commercial product forms a crystalline powder, chiefly of a yellow colour owing to the presence of Iron as an impurity.

Dose.—5 to 8 grains = 0·32 to 0·52 gramme.

The use of Aluminium Chloride in doses of 5 grains = 0·32 gramme, and upwards several times a day has proved remarkably efficacious in locomotor ataxy.—*L.* '99, ii. 1826.

Hydrated Aluminium Chloride is official in Russ.

Under the names of **Chloralum** and **Chloralum Powder,** preparations containing Aluminium Chloride have been introduced as disinfectants.

ALUMINIUM CHLORIDE SOLUTION.—Obtained by dissolving Aluminium Hydrate in Hydrochloric Acid. A pale yellow liquid. Sp. gr. 1·250. **Gargle,** 12 minims to 1 oz. of Water; **Spray,** 3 minims to 1 oz.; **Paint,** 15 minims to 1 oz. Astringent and antiseptic.

ALUMINIUM NITRATE.—A **solution** (4 or 6 grains in 1 oz. of Water) has been used with success in pruritus vulvæ.

ALUMINIUM NAPHTHOL-SULPHONATE (Alumnol).—A whitish powder, readily soluble in Water, introduced as an antiseptic.—*P.J.* (3) xxiii. 605; *C.D.* '93, i. 94.

In treatment of metrorrhagia. Used as an intra-uterine injection, with Tincture of Iodine (Alumnol, 2·5; Tincture of Iodine, 25; Absolute Alcohol, 25) by means of an intra-uterine syringe.—*M.A.* '99, 408.

Dose.—4 to 8 grains = 0·26 to 0·52 gramme, as an astringent.

ALUMINIUM OLEATE.—A powder. Mixed with equal parts of Lard, is used as a styptic and antiseptic, in checking the muco-purulent discharges in eczema.—*L.* '84, ii. 123.

ALUMINIUM SULPHATE.—White crystalline cakes, or in a white powder, having a sweetish and somewhat astringent taste. It is soluble 1 in 1 of Water, insoluble in Alcohol (90 p.c.). Astringent and antiseptic.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Jap., Russ., Swed., Swiss and U.S.

Tests.—Aluminium Sulphate dissolves readily in Water, forming a solution which has a strong acid reaction towards blue Litmus paper, this solution yields with Ammonia Solution a white precipitate practically insoluble in excess of the reagent; with Potassium Hydroxide Solution it yields a white gelatinous precipitate soluble in excess of the reagent, but which is again precipitated on the addition of Ammonium Chloride. The solution yields with Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid. It should contain about 99½ p.c. of pure crystallised Aluminium Sulphate, and shall lose not more than 45·7 p.c. of its weight when deprived of its Water of crystallisation.

It should yield no odour of Ammonia when boiled with Potassium Hydroxide Solution, indicating the absence of Ammonium salts. When slightly acidified with diluted Hydrochloric Acid the aqueous solution should not afford an appreciable darkening in colour or a turbidity, on the addition of Hydrogen Sulphide, indicating the absence of more than the slightest traces of Copper or

Lead, nor should it be materially darkened in colour on the subsequent addition of Ammonia Solution in slight excess, indicating the absence of more than a trace of Iron.

A clear filtered aqueous 10 p.c. w/v solution of the salt should not become more than faintly opalescent within 5 minutes upon the addition of an equal volume of Tenth-normal Volumetric Sodium Thiosulphate Solution, indicating the limit of free acid.

Aluminium Caseinate.—A yellowish-white, tasteless powder. Insoluble in Water. Introduced as an intestinal astringent.

Dose.—5 grains = 0·32 gramme.

Salumin Insoluble (Aluminium Salicylate), **Salumin Soluble** (Aluminium and Ammonium Salicylate), **Alkasal** (Aluminium Potassium Salicylate), **Boral** (Aluminium Borotartrate), **Cutol** (Aluminium Borotannate), are preparations containing Aluminium, which have been noticed in medical literature.

CIMOLITE.—The mineral has yielded on analysis: Alumina, 23; Silica, 63; Ferric Oxide, 1·25; Water, 12.

A proprietary Toilet article, which is a silicate in very fine powder, is sold under the name 'Cimolite.'

FULLER'S EARTH has yielded on analysis: Alumina, 10; Silica, 53; Lime, 0·5; Magnesia, 1·25; Ferric Oxide, 9·5; Water, 24.

SOAPSTONE, CRETA GALLICA, is a Silicate of Aluminium and Magnesium. Is used in prurigo and as a dusting powder for infants, alone or mixed with equal parts of Zinc Oxide or Calamine.

AMMONIACUM.

AMMONIACUM.

FR., GOMME AMMONIAQUE; GER., AMMONIAKGUMMI; ITAL., GOMMA AMMONIACO; SPAN., GOMA AMONIACO.

A gum-resin, obtained from *Dorema Ammoniacum*, D. Don., and probably other species.

It is collected in Persia.

Solubility.—Sparingly in Water, but forms with it a nearly white emulsion; when 50 grains were digested in 2 oz. of Alcohol (90 p.c.), 40 grains were dissolved; with Alcohol (60 p.c.) 30 grains were dissolved.

Medicinal Properties.—Antispasmodic, stimulant, expectorant; useful in chronic bronchitis and asthma of old people, either in mixture or in pill; as a **plaster** to promote absorption in chronic synovitis and glandular swellings.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Prescribing Notes.—*Generally given as Mistura Ammoniaci; may be combined with Tincture of Squill, or Fetid Spirit of Ammonia.*

Official Preparations.—Emplastrum Ammoniaci cum Hydrargyro and Mistura Ammoniaci. Contained also in Emplastrum Galbani, in Pilula Scillæ Composita, and Pilula Ipecacuanhæ cum Scillâ.

Not Official.—Pilulæ Ammoniaci Opiatæ, Emplastrum Gummi Resinosum.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Ger., Hung., Ital., Jap., Mex. (Goma-resina Ammoniaco), Norw., Port., Russ., Span., Swed. and Swiss; Fr., purified by 60 p.c. Alcohol.

Descriptive Notes.—Commercial Ammoniacum is imported from Persia, and is believed to be obtained also from *D. Aucheri*, Boiss. It occurs generally in the form of rounded nodules or tears varying in size up to 1 inch (25 mm.) in diameter, although averaging only about ½ inch (12 mm.). When recently collected the tears are yellowish-white or nearly white, dull externally and opaque internally with a white, slightly polished, fracture, and have an acrid, slightly bitter, characteristic taste. Occasionally masses consisting of tears welded together are imported, but these usually contain more or less impurity. When the drug has been long kept the tears assume a brownish-yellow tint.

The official description allows the use of both pale yellow and brownish tears, which may be either white or brownish-yellow internally, and they may vary in size from ¼ to 1 inch (6 to 25 mm.). The odour must not be alliaceous.

Tests.—The distinguishing tests for Ammoniacum are its physical properties, the production of a Salicylic Acid reaction with Ferric Chloride Test-solution, a yellow to a brown coloration with Potassium Hydroxide Solution, and an orange-red coloration with Chlorinated Soda Solution.

B.P. has not yet adopted the determination of the Acid and Saponification values as a means of distinguishing gums and gum-resins. Notwithstanding the difficulty experienced in sampling and the wide variations between the figures yielded by different specimens, a determination of these constants may often afford a valuable criterion of the purity of a sample. Good commercial Ammoniacum has an Acid value of 92 to 105, and a Saponification value of 145 to 162 according to Dieterich. A sample of good commercial 'tear' Ammoniacum examined in the author's laboratory had an ash limit of 2·15, and gave an Acid value of 106·7, a Resin value of 153·03, a Gum value of 23·87, and a Saponification value of 176·9. A sample of 'mass' Ammoniacum showing an ash limit of 2·55 p.c., gave an Acid value of 101·04, a Resin value of 144·61, a Gum value of 21·06, and a Saponification value of 165·67; 2 samples of powdered Ammoniacum yielding respectively 4·3 and 7·05 p.c. of ash, gave in each instance Acid values of 101·04, Resin values respectively of 150·22 and 153·03, Gum values of 18·26 and 9·83, and Saponification values of 168·48 and 162·86. Dieterich gives the Resin value of commercial varieties as 99·4 to 155·4, the Gum value as 7 to 46·2, and ash of not over 10 p.c.

The more generally occurring impurities are excess of mineral matter and an excessive proportion of matter insoluble in Alcohol (90 p.c.). The absence of Umbelliferone serves to distinguish it from Asafetida and Galbanum. The *B.P.* method of performing this test by heating the gum-resin strongly in a dry test-tube, cooling, boiling with Water, diluting the resulting liquid largely with Water and making alkaline with Ammonia, is considered unsatisfactory, the value of the test depending greatly on the manner in which the gum-resin is heated. The *P.G.* test is a more scientific one and is capable of detecting 2 p.c. of Galbanum with certainty. The Ammoniacum is boiled with three times its weight of strong Hydrochloric Acid for a quarter of an hour, whereby the Umbelliferone is split off from its natural Ester, the fluid is filtered, and the filtrate supersaturated with Ammonia Solution. It should not exhibit a blue fluorescence when examined by reflected light.

The *B.P.* gives no indication of the limit of matter insoluble in Alcohol (90 p.c.), nor of the amount of mineral matter. *P.G.* on the other hand specifies that the insoluble matter remaining after complete exhaustion of the gum-resin with boiling Alcohol (90 p.c.) shall amount at the highest to 40 p.c., and fixes the ash limit at not more than 5 p.c., which is somewhat low. A limit of 7·5 p.c. of ash has been suggested. The average of a number of good commercial samples examined in the author's laboratory was 6 p.c.

Preparations.

EMPLASTRUM AMMONIACI CUM HYDRARGYRO. *See* HYDRARGYRUM.

As the value of this preparation depends chiefly upon the Mercury it contains, the formula is given under Hydrargyrum.

MISTURA AMMONIACI. AMMONIACUM MIXTURE.

Ammoniacum, in coarse powder, ¼ oz.; Syrup of Tolu, 4 fl. drm.; Distilled Water, 7½ fl. oz. (1 in 32)

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.

Foreign Pharmacopœias.—Official in Span. (Emulsion), 1 in 33 with White Wine. Not in the others.

Not Official.

PILULÆ AMMONIACI OPIATÆ (*Swed.*).—Ammoniacum, 10; Myrrh, 5; Squills, 2; Opium, 1; Water, *q.s.* to make 100 pills.

EMPLASTRUM GUMMI RESINOSUM.—Is official in *Dan.* and *Norw.* *Swiss* containing 6 p.c. of Ammoniacum; *Port.* (Emplastro Gummoresinoso) containing 2 p.c. of Ammoniacum. Made with Emplastrum Plumbi.

AMMONIÆ LIQUOR FORTIS.

STRONG SOLUTION OF AMMONIA.

A transparent, colourless, very alkaline liquid, with an overpowering pungent smell, containing 32·5 p.c. (or more correctly 32·35 p.c.) by weight of Ammonia, $\mathbf{NH_3}$, eq. 16·94.

It should be preserved in well-stoppered glass bottles, which should be keptin a cool atmosphere. Great care should always be exercised in dealing with the liquid.

It may be prepared by the decomposition of an Ammonium salt, usually the Chloride, with Calcium Hydroxide, the resulting gas being dissolved in Water.

In commerce Liquor Ammoniæ Fortis is generally sold of sp. gr. 0·880.

Medicinal Properties.—Usually given in the more diluted form of Solution of Ammonia. *See* below.

Official Preparations.—Of **Liquor Ammoniæ Fortis,** Liquor Ammoniæ, Spiritus Ammoniæ Fetidus. Contained in Linimentum Camphoræ Ammoniatum, Linimentum Hydrargyri, and Tinctura Guaiaci Ammoniata. Used in the preparation of Ammonii Benzoas, Ammonii Bromidum, Ammonii Phosphas, Spiritus Ammoniæ Aromaticus, and Spiritus Ammoniæ Fetidus. Of the **Liquor Ammoniæ,** Linimentum Ammoniæ. Contained in Tinctura Ergotæ Ammoniata, Tinctura Opii Ammoniata, Tinctura Quininæ Ammoniata, Tinctura Valerianæ Ammoniata. Used in the preparation of Liquor Bismuthi et Ammonii Citratis, and the scale preparations of Iron.

Not Official.—Alcohol Ammonia, Lotio Crinalis, Oleate of Ammonia, Liquor Ammoniæ Detergens, and Tinct. Ammon. Comp. (Eau de Luce).

Antidotes.—Acetic Acid or Vinegar well diluted with Water; demulcent drinks.

Foreign Pharmacopœias.—Official in Belg. (Ammonium Hydricum Solutum), sp. gr. 0·935, 17 p.c.; Fr. (Ammoniaque Officinale), sp. gr. 0·925; Ital. (Ammoniaca), sp. gr. 0·925, 20 p.c.; Mex. (Ammoniaco), sp. gr. 0·920; Port. (Ammonia Liquida), sp. gr. 0·916; Span. (Amoniaco), sp. gr. 0·923; U.S. (Aqua Ammoniæ Fortior), sp. gr. 0·897 at 25° C. (77° F.), 28 p.c.; *see* also Liquor Ammoniæ.

Tests.—The distinguishing tests are the powerful ammoniacal odour combined with the specific gravity and the volumetric determination figure. The *B.P.* specific gravity is 0·891 at 15·5° C. (60° F.); the *U.S.P.* is 0·897 at 25° C. (77° F.). It is officially required to indicate 32·35 p.c. by weight of Ammonia (NH_3) as ascertained by titration with Normal Volumetric Solution of Sulphuric Acid. It is officially described as containing 32·5 p.c. by weight of NH_3. The *B.P.* does not mention an indicator; the *U.S.P.* gives the choice of Litmus or Methyl Orange Solution.

So far as impurities are concerned Liquor Ammoniæ Fortis should respond to the tests given under Liquor Ammoniæ, *q.v.*

Aqua Ammoniæ Fortior *U.S.P.* when diluted with twice its volume of Distilled Water should respond to the *U.S.P.* volumetric test given under Liquor Ammoniæ. The *P.G.* recognises only the dilute Ammonia.

LIQUOR AMMONIÆ. SOLUTION OF AMMONIA.

A clear, colourless liquid, containing 10 p.c. by weight of Ammonia, $\mathbf{NH_3}$; prepared by mixing 1 of strong Solution of Ammonia with 2 of Distilled Water.

It possesses a characteristic pungent odour, a powerfully caustic taste, and strongly alkaline reaction.

It should be preserved in well-stoppered bottles, which should be kept in a cool atmosphere.

Medicinal Properties.—A general stimulant. Externally (applied to the nostrils) in syncope; an excellent application to the sting of a wasp or the bites of insects. On the skin it is a powerful rubefacient, and in embrocations it is used as a counter-irritant for pain, stiffness of joints, bronchitis, etc. Was at one time used by injection as an antidote to snake bites, but Potassium Permanganate is now considered a better antidote.

Dose. 10 to 20 minims = 0·6 to 1·2 c.c., well diluted.

Prescribing Note.—*Ammonia is more generally prescribed internally in the form of Spiritus Ammoniæ Aromaticus or of Ammonium Carbonate.*

Official Preparations.—Linimentum Ammoniæ. Used in the preparation of Ammonii Benzoas, Ferri et Ammonii Citras, Ferri et Quininæ Citras, Ferrum Tartaratum, Liquor Bismuthi et Ammonii Citratis, Tinctura Opii Ammoniata, Tinctura Quininæ Ammoniata.

Not Official.—Liquor Ammonii Anisatus, Spiritus Ammonii Anisatus, Spiritus Ammoniæ Fœniculatus, Spiritus Ammoniæ.

Foreign Pharmacopœias.—Official in Austr., Dan., Dutch, Fr. (Ammoniaque Diluée), Ger., Hung., Jap., Norw., Russ., Swed., Swiss, 10 p.c.; U.S. (Aqua Ammoniæ), 10 p.c., sp. gr. 0·958 at 25° C. (77° F.); Belg., Fr., Ital., Mex., Port., Span. and U.S., *see* Ammon. Liq. Fort.

Tests.—The distinguishing tests for Liquor Ammoniæ are the pungent ammoniacal odour, the sp. gr. at 15·5° C. (60° F.), which should be 0·959 [0·958 at 25° C. (77° F.), *U.S.P.*; 0·960, *P.G.*], and that it is officially required to indicate 10 p.c. by weight of Ammonia (NH_3) when titrated with Normal Volumetric Sulphuric Acid Solution. Neither *B.P.* nor *P.G.* make any reference to the indicator of neutrality to be used; the *U.S.P.* states Litmus or Methyl Orange Test-solution; the latter is usually employed, Phenolphthalein Solution being useless.

The *B.P.* volumetric test indicates 10·0 p.c. by weight of Ammonia (NH_3); the *P.G.* 9·95 p.c. to 10·0 p.c. by weight. *U.S.P.* defines it as containing 10 p.c. by weight of Ammonia gas.

When a glass rod moistened with Hydrochloric Acid is brought near Ammonia Solution dense white fumes of Ammonium Chloride are given off. Ammonia Solution when sufficiently highly diluted yields on the addition of Potassio-mercuric Iodide (Nessler's) Solution a characteristic brown coloration, which in the presence of much Ammonia changes to a brown or reddish-brown precipitate.

The more generally occurring impurities are empyreumatic and mineral matter; heavy metals, *e.g.*, Arsenic, Iron, Lead, and Zinc; Ammonium Carbonate or Carbamate, Calcium, Carbonates, Chlorides, and Sulphates. The *B.P.* specifically mentions a test for absence of tarry matters, requiring that no colour or odour should be produced on the addition of a slight excess of Hydrochloric Acid to a mixture of equal volumes of Ammonia and Water, but is content to group the remainder without any regard to their relative importance under the expression 'it shall yield no characteristic reaction for,' etc. When rendered faintly acid by the addition of Hydrochloric Acid it should be unaffected by Hydrogen Sulphide Solution, indicating the absence of Arsenic and Lead. On subsequently rendering the solution again alkaline by the addition of Ammonia Solution no perceptible darkening in colour or turbidity should be produced, indicating the absence of more than a faint trace of Iron or Zinc. The solution should not effervesce on the addition of diluted Hydrochloric Acid, indicating the absence of Carbonates, when almost neutralised with Hydrochloric Acid it should not yield an opalescence on the addition of Ammonium Oxalate Solution, indicating the absence of Calcium. When supersaturated with Nitric Acid it shall yield little or no turbidity on the addition of Silver Nitrate Solution, nor on the addition of Barium Chloride Solution, indicating the absence of more than traces of Chlorides and Sulphates. The *U.S.P.* and *P.G.* require the neutralised acid to yield, on evaporation, a residue which is completely volatilised on ignition, the *P.G.* also requiring the residue to be colourless. No reference to fixed impurity or the character of the residue left on evaporation occurs in the *B.P.* The *P.G.* requires that when diluted with 4 times its volume of Calcium Hydroxide Solution it should show only a faint turbidity after the lapse of one hour, indicating the absence of Ammonium Carbonate and Carbamate. No test similar to this appears in the *B.P.* The test with Decinormal Volumetric Potassium Permanganate Solution for readily oxidisable organic impurities is peculiar to the *U.S.P.* If 0·1 c.c. of Tenth-normal Volumetric Potassium Permanganate Solution be added to 10 c.c. of Ammonia Solution, slightly supersaturated with diluted Sulphuric Acid, the pink colour produced should not be completely destroyed within 10 minutes.

Volumetric Determination.—1 gramme neutralises 5·9 c.c. of V.S. of Sulphuric Acid, *B.P.;* 5 c.c. should require 28 to 28·2 c.c. Normal V.S. of Hydrochloric Acid, *P.G.;* the *U.S.P.* gives the following directions for making the determination :—Introduce into a stoppered weighing bottle 3 c.c. of Ammonia Water and weigh accurately. Dilute with 50 c.c. of Distilled Water and titrate with normal V.S. of Sulphuric Acid, using Litmus or Methyl Orange T.S. as indicator. Multiply the number of c.c. of the V.S. of Sulphuric Acid consumed by 1·693, and divide this product by the weight of the Ammonia Water taken; the quotient represents the percentage of Ammonia gas.

Preparations.

LINIMENTUM AMMONIÆ. Liniment of Ammonia.

Solution of Ammonia, 1; Almond Oil, 1; Olive Oil, 2. Mix by shaking. (1 in 4)

Cotton Seed, Sesame and Nut Oils have each been recommended, but Cotton Seed is the only Oil which makes a satisfactory and permanent Emulsion.

Foreign Pharmacopœias.—Official in Austr., Dutch, Hung. and Jap., 1 and 4 Sesame Oil; Belg., 1 and 9 Medicinal Oil; Fr., 1 and 9 Olive Oil; Ger., Liq. Am. 1, Olive Oil 3, Poppy Oil 1; Ital., 1 and 4 Olive Oil; Mex., 1 Sesame Oil 9; also 1, Sesame Oil 4; Port., 1 and 4 Almond Oil; Russ., Liq. Am. 1, Olive Oil 3, Sesame Oil 1; Span., 1 and 9 Olive Oil; Swed., 1 and 3 Olive Oil; Swiss, 1 and 3 Sesame Oil; U.S., Am. 35, Alcohol 5, Cotton Seed Oil 57; Oleic Acid, 3. Not in Norw. All by weight, except U.S.

SPIRITUS AMMONIÆ AROMATICUS. *See* Ammonii Carbonas.

SPIRITUS AMMONIÆ FETIDUS. Fetid Spirit of Ammonia.

Asafetida, 1½; strong Solution of Ammonia, 2; Alcohol (90 p.c.), to make 20. (1½ in 20)

Nervine stimulant and antispasmodic, useful in hysteria.

Dose.—For repeated administration, 20 to 40 minims = 1·2 to 2·4 c.c.; for a single administration, 60 to 90 minims = 3·6 to 5·3 c.c.

Tests.—A clear, almost colourless liquid, possessing a pungent ammoniacal and alliaceous odour. It has a specific gravity of 0·848, and it is officially required to contain 2·88 grammes of Ammonia (NH_3) per 100 c.c. as indicated by titration with Normal Volumetric Sulphuric Acid Solution, using Methyl Orange Solution as an indicator of neutrality. The *B.P.* does not include a figure for specific gravity, but gives the volumetric test; it, however, does not state what indicator of neutrality is to be employed.

Not Official.

ALCOHOL AMMONIA.—Absolute Alcohol saturated with Ammonia gas. It contains about 14 p.c. of NH_3.

It is used in filling and renovating Smelling Salt bottles.

LOTIO CRINALIS.—Ol. Amygdal., 1 fl. oz.; Liq. Ammon. Fort., 1 fl. oz.; Sp. Rosmar., 4 fl. oz.; Aq. Mellis, 2 fl. oz.

This has been incorporated in the *B.P.C.* as follows:—

Almond Oil, 12·50; Strong Solution of Ammonia, 12·50; Oil of Rosemary, 0·50; Alcohol, 50; Honey Water, *q.s.* to produce 100.

SPIRITUS or LIQUOR AMMONII ANISATUS.

Austr. and *Ger.*—Anethol, 1; Alcohol, 24; Solution of Ammonia, 5.

Belg. (Ammoniæ Spiritus Anisatus).—Anethol, 3; Alcohol, 77; Solution of Ammonia, 20.

Hung. and *Russ.*—Oil of Anise, 1; Alcohol, 24; Solution of Ammonia, 6.

Ital. and *Span.*—Oil of Anise, 1; Alcohol, 24; Solution of Ammonia, 5.

Dan., *Norw.* and *Swed.*—Oil of Anise, 1; Alcohol, 32; Solution of Ammonia, 7.

Dutch.—Oil of Anise, 1; Alcohol, 19; Solution of Ammonia, 5.

Swiss.—Oil of Anise, 3; Alcohol, 77; Solution of Ammonia, 20.

All by weight.

B.P.C. (Liquor Ammoniæ Anisatus).—Anethol, 3·50; Solution of Ammonia, 16·50; Alcohol, *q.s.* to produce 100.

Spiritus Ammoniæ Fœniculatus.—Oil of Fennel, 3; Alcohol, 80; Ammonia Water, 17.—*Jap.*

Spiritus Ammoniæ.—Stronger Ammonia Water, 250; Alcohol, *q.s.* to make the product contain 10 p.c. by weight of Ammonia Gas.—*U.S.*

OLEATE OF AMMONIA.—Oleic Acid, 1 oz.; Spirit, 1 oz.; Solution of Ammonia, 7 oz.; Distilled Water, to 16 oz. Pour the acid into a bottle, mix the Spirit and Ammonia, and pour into the bottle. Cork tightly, and allow to stand a week or more until saponification is complete. This is suitable for adding to Solution of Ammonia (1 to 8) to make a household article.—*Pharm. Form.*

Liquor Ammoniæ Detergens. *Syn.* Household Ammonia.—Strong Solution of Ammonia, 30; Oleic Acid, 6; Alcohol, 6; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

Note.—If a 'cloudy' preparation be desired, about half of the Distilled Water in the above formula should be replaced by hard tap Water, the exact proportion depending upon the amount of total solids in the hard Water.—*B.P.C.*

TINCTURA AMMONIÆ COMPOSITA. EAU DE LUCE.—Mastic, 2 drm.; Alcohol (90 p.c.), 9 fl. drm.; Ol. Lavand., 14 minims; Liquor Ammoniæ Fortis, 20 fl. oz.

This has been incorporated in the *B.P.C.* as follows:—

Mastic, 1·25; Alcohol, 5·50; Oil of Lavender, 0·15; Strong Solution of Ammonia, *q.s.* to produce 100.

Stimulant, antispasmodic. Has been used in tropical countries as an application to snake bites.

Dose.—5 to 10 minims = 0·3 to 0·6 c.c., in Water.

AMMONII BENZOAS.

AMMONIUM BENZOATE.

FR., BENZOATE D'AMMONIUM; GER., AMMONIUMBENZOAT; ITAL., BENZOATO DI AMMONIO; SPAN., BENZOATO AMONICO.

$NH_4C_7H_5O_2$, eq. 138·07.

Fine, white laminar crystals, or a crystalline powder, odourless or possessing a faint odour of Benzoin, and a saline taste. It is produced by the combination of Benzoic Acid with Ammonia. It gradually loses Ammonia on exposure to air.

Solubility.—1 in 6 of Water; 1 in 22 of Alcohol (90 p.c.); 1 in 8 of Glycerin.

It will not quite dissolve 1 in 5 of Water, as sometimes stated.

Medicinal Properties.—Valuable in chronic vesical catarrh with alkaline urine and phosphatic deposit, and in chronic bronchial catarrh with much secretion. It is more soluble than Benzoic Acid, and therefore should be preferred, and is less irritant to the alimentary canal.

An intestinal antiseptic in typhoid.—*M.A.* '94, 555.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Prescribing Note.—*Usually given in solution.*

Incompatibles.—Acids, Liquor Potassæ, and Ferric salts.

Foreign Pharmacopœias.—Official in Jap., Mex., Port., Russ., Span., Swiss and U.S.

Tests.—The distinguishing tests for Ammonium Benzoate are the odour of Ammonia, which is evolved when its aqueous solution is heated with Solution of Potassium or Sodium Hydroxide; the yellowish-brown coloration, produced when its sufficiently diluted aqueous solution is treated with Potassio-mercuric Iodide (Nessler's) Solution; the crystalline precipitate thrown down when its sufficiently concentrated aqueous solutions are acidified with a mineral acid; and the characteristic buff-coloured precipitate produced on adding Test-solution of Ferric Chloride to its aqueous solution. The *U.S.P.* requires that it should contain not less than 98 p.c. of pure Ammonium Benzoate, but does not state a method of determination.

The more generally occurring impurities are mineral matter, shown by a residue being left on ignition; free Benzoic Acid, indicating imperfections in the process of manufacture, and detected by the reaction of its cold aqueous solution towards blue Litmus paper or Solution, it should be neutral or only slightly acid; Chlorides and Sulphates, which indicate Toluene or Hippuric Acid as its probable source, and which are detected by the usual tests for Chlorides and Sulphates after removal of the Benzoic Acid. The 10 p.c. w/v aqueous solution is acidified with diluted Nitric Acid, and the precipitated Benzoic Acid is separated by filtration; the filtrate should be unaffected by the addition of either Silver Nitrate or Barium Chloride Solution. The *B.P.* includes tests for all these impurities. *U.S.P.* includes heavy metals as a likely impurity, and requires that the acidulated, filtered 5 p.c. aqueous solution of the salt shall respond to the time-limit test for heavy metals. It also requires that the Benzoic Acid prepared from the salt shall answer the tests and be free from the impurities given under Benzoic Acid. No such requirement appears in the *B.P.*, either under this heading or under Sodium Benzoate.

Residue.—On strongly heating it emits vapours having the odour of Ammonia and Benzoic Acid; and is finally volatilised, *U.S.P.*; at a red heat it leaves no residue, *B.P.*

Not Official.

AMMONII BORAS.

A crystalline salt, with an alkaline reaction.

Solubility.—1 in 15 of Water.

Medicinal Properties.—Has been used with success in renal and vesical calculi.

For renal colic, 20 grains = 1·3 grammes, every two hours until free passage of urine takes place, then 15 grains = 1 gramme, three times a day.—*T.G.* '87, 623.

AMMONII BROMIDUM.

AMMONIUM BROMIDE.

NH_4Br, eq. 97·29.

FR., BROMURE D'AMMONIUM; GER., AMMONIUMBROMID; ITAL., BROMURO DI AMMONIO; SPAN., BROMURO AMONICO.

Small, colourless and odourless, prismatic crystals, or a white crystalline powder possessing a pungent saline taste.

It is prepared by the neutralisation of Hydrobromic Acid by Ammonia.

Solubility.—1 in 1½ of Water, and measures 2; 1 in 15 of Alcohol (90 p.c.).

Medicinal Properties.—An excellent nervine sedative and depressant, especially useful for sleeplessness, the result of worry or mental anxiety and fatigue; anaphrodisiac; given in epilepsy, with Chloral in acute alcoholism, in acute mania and nymphomania, and in many other conditions in which the Potassium salt is used. Not so apt to produce Bromism as the Potassium salt, and less depressing. Relieves headache, especially in migraine, and neuralgic pain. Sedative in pharyngeal and laryngeal irritation. Useful in whooping-cough and asthma.

Reference to the use of this salt in the treatment of epilepsy appears in *L.* '05, i. 710. If benefit does not follow a daily dose of from 45 to 60 grains of one or a combination of the Bromide salts in epilepsy, some other remedy or method of treatment should be sought. In confirmed epilepsy with mental deterioration, all that can be expected from the continuous use of the Bromides is diminution in the number and perhaps in the severity of the seizures. In serial epilepsy and the status epilepticus Chloral in combination with the Bromides forms the most effective remedy.

Dose.—5 to 30 grains = 0·32 to 2 grammes.

Incompatible.—Spirit of Nitrous Æther.

Not Official Preparations.—Ammonium Bromide Effervescens, Elixir Ammonii Bromidi, Pastillus Ammonii Bromidi, Trochisci Ammonii Bromidi.

Foreign Pharmacopœias.—Official in Austr., Dan., Dutch, Fr., Ger., Ital., Jap., Mex. (Bromuro de Amonio), Norw., Russ., Span., Swed., Swiss and U.S. Not in the others.

Tests.—The distinguishing tests for Ammonium Bromide are that an aqueous solution of the salt shall, when heated with Sodium or Potassium Hydroxide Solution, evolve Ammonia, the latter is readily recognised by its odour or its immediately turning a piece of moistened red Litmus paper blue; the sufficiently diluted aqueous solution yields a yellowish-brown coloration with Potassio-mercuric Iodide (Nessler's) Solution. The aqueous solution of the salt should yield with Silver Nitrate Solution a yellowish-white precipitate insoluble in Nitric Acid, practically insoluble in dilute Ammonia Solution, but soluble in Potassium Cyanide Solution. On the addition of Chlorine Solution to an aqueous solution of the salt, Bromine is set free, which on shaking with a little Chloroform or Carbon Bisulphide yields a reddish solution. It is officially required to contain not less than 99·43 p.c. nor more than 100·79 p.c. of pure Ammonium Bromide; 0·5 gramme of the salt requiring, when dissolved in Water, not less than 51·1 c.c. nor more than 51·8 c.c. of Volumetric Silver Nitrate Solution. The *U.S.P.* requires it to contain not less than 97 p.c. of Ammonium Bromide; the *P.G.* not more than 100·98 p.c. The volumetric determination adopted by the *B.P.* is carried out on the dry salt; but no indication of the limit of Water permissible is given.

The *P.G.* also employs a salt dried at 212° F. (100° C.) in carrying out the volumetric determination. The *U.S.P.* does not direct the salt to be dried.

The more generally occurring impurities are heavy metals, *e.g.*, Copper, Lead and Iron, Barium, Bromates, Chlorides, Iodides and Sulphates. A 5 p.c. aqueous solution of the salt when slightly acidified with Hydrochloric Acid should be unaffected by Hydrogen Sulphide Solution, indicating the absence of Copper and Lead. The *U.S.P.* and the *P.G.* include a separate test for Iron with Potassium Ferrocyanide Solution, which is given in the small type below. Barium, Bromates, Iodides and Sulphates may, if present, be detected by the tests given under the respective headings of Potassium Sulphate Solution, Diluted Sulphuric Acid, Chlorine Water, Chloroform and Barium Nitrate Solution. The precipitate produced on the addition of Silver Nitrate Solution to an aqueous solution of the salt should be practically insoluble in Ammonia, and the filtered ammoniacal liquid should yield little or no opalescence when supersaturated with Nitric Acid, indicating the absence of more than a trace of Chlorides. The salt should be entirely volatilised on heating leaving no weighable residue, indicating the absence of fixed matter.

Chlorine Water and Chloroform.—If Chloroform be added to an aqueous solution of the salt (1 c.c. Chloroform and 10 c.c. of a (1-20) solution, *U.S.P.*), and Chlorine Water (diluted with an equal volume of Water, *U.S.P.*) be carefully introduced with constant agitation, the Chloroform is coloured reddish-brown, *P.G.*; yellow to orange, *U.S.P.*; free from any violet tint, *U.S.P.*

Diluted Sulphuric Acid.—A small quantity of the salt spread out on a porcelain slab should not at once assume a yellow colour on the addition of a few drops of diluted Sulphuric Acid (test for Bromate), *P.G.* and *U.S.P.*

The aqueous solution (1 in 20) should be unaffected by diluted Sulphuric Acid, *P.G.*

Barium Nitrate Solution.—The aqueous solution should be unaffected by Barium Nitrate Solution, *P.G.*

Potassium Sulphate Solution.—There should be no turbidity in 10 c.c. of a (1–20) aqueous solution acidulated with Acetic Acid, on the addition of 1 c.c. Potassium Sulphate Solution, *U.S.P.*

Potassium Ferrocyanide Solution.—20 c.c. of an aqueous solution (1–20) should not be immediately turned blue on the addition of 0·5 c.c. Potassium Ferrocyanide Solution, *P.G.* *U.S.P.* uses a 1–100 solution of the salt, but does not state test quantities.

Volumetric Determination.—10 c.c. of a solution of 3 grammes in 100 c.c. of Water, with the addition of a few drops Potassium Chromate Solution (1 drop, *P.G.*) should require not more than 30·9 c.c. (*P.G.*), 31·6 c.c. (*U.S.P.*), of the Deci-normal Volumetric Solution of Silver Nitrate to produce a permanent red colour; the *U.S.P.* directs the salt itself to be used for titration without drying; the *P.G.* uses the salt previously dried at 100° C. (212° F.).

Not Official.

AMMONII BROMIDUM EFFERVESCENS, is made of 2 strengths containing 5 and 10 grains in 60 grains.

ELIXIR AMMONII BROMIDI.—Ammonium Bromide, 85; Citric Acid, 4; Aromatic Elixir (*U.S.P.*), *q.s.* to make 1000.—*U.S.N.F.* 1896.

In *U.S.N.F.* 1906 the formula remains the same without the Citric Acid, which is omitted.

Contains 5 grains of Ammonium Bromide in each fl. drm.

Ammonium Bromide, 10; Citric Acid, 0·50; Aromatic Elixir, *q.s.* to produce 100.—*B.P.C.*

Contains about 5½ grains in each fl. drm.

The *B.P.C.* appears to contain twice as much Compound Spirit of Orange as does the *U.S.P.*, but as the *B.P.C.* Compound Spirit is half the strength, the flavouring of the two Elixirs is about the same. The alterations in the *B.P.C.* *Supplement* leave the result much the same.

LOZENGES, containing 2 grains = 0·13 gramme, of Ammonium Bromide in each. Useful in whooping-cough.

Dose.—1 to 3 lozenges.

Pastilles containing 1 grain in each with Glyco-gelatin Basis.

AMMONII CARBONAS.

AMMONIUM CARBONATE.

FR., CARBONATE (SESQUI) D'AMMONIAQUE; GER., AMMONIUMCARBONAT; ITAL., CARBONATO DI AMMONIO; SPAN., CARBONATO AMONICO.

A mixture of Ammonium Hydrogen Carbonate, $\mathbf{NH_4HCO_3}$, with Ammonium Carbamate, $\mathbf{NH_4NH_2CO_2}$.

Hard, transparent, crystalline masses, possessing a strong ammoniacal, but not empyreumatic, odour and strong alkaline reaction. It effloresces when exposed to the air, and becomes covered on the surface with a white powder. On this account it should be kept in well-stoppered bottles and in a cool atmosphere. Only the translucent portions of the mass should be used for dispensing purposes.

Solubility.—1 in 4 of Water; 1 in 200 of Alcohol (90 p.c.); 1 in 5 of Glycerin.

Medicinal Properties.—Gastric, cardiac, and general stimulant; a valuable expectorant, frequently combined with Ipecacuanha in acute and chronic bronchitis when the phlegm is tough and scanty. Rarely as an emetic in ½ drm. doses.

Has been recommended in full and continuous doses in cholera, in the place of alcoholic stimulants.

Dose.—3 to 10 grains = 0·2 to 0·65 gramme.

Prescribing Note.—15 *grains dissolved in Water are taken with* 17 *grains of Citric Acid to form a saline draught.*

Incompatibles.—Acids, Acid salts, Iron salts, Lime Water, and salts of the alkaline earths and of the alkaloids.

Official Preparations.—Used in the preparation of Ammonii Chloridum, Bismuthi Carbonas, Ferri Carbonas Saccharatus, Liquor Ammonii Acetatis, Liquor Ammenii Citratis, and Spiritus Ammoniæ Aromaticus.

Not Official.—Linctus Ammoniæ Compositus, Liquor Ammonii Acetatis Fortior, Liquor Ammonii Citratis Fortior, Liquor Volatilis Cornu Cervi or Spirits of Hartshorn, Mistura Ammoniæ cum Senega, Hartshorn and Oil, and Ammonium Bicarbonate.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Port., Russ., Span., Swiss and U.S.

Tests.—The distinguishing tests for Ammonium Carbonate are its strong ammoniacal odour and alkaline reaction; when heated, either alone or with Potassium or Sodium Hydroxide Solution, it evolves Ammonia; its sufficiently diluted aqueous solution yields a yellowish-brown coloration with Nessler's reagent (Potassio-mercuric Iodide Solution); it effervesces with dilute mineral acids, evolving a gas which causes a white precipitate with Lime Water, and its aqueous solution yields with Barium Chloride Solution a white precipitate, soluble with effervescence in diluted Hydrochloric Acid.

Each gramme is officially required to neutralise not less than 18·7 c.c. of Volumetric Sulphuric Acid Solution, corresponding to 97·25 p.c. of a salt of the pharmacopœial composition. This figure is considered too high even for the best specimens, and it has been suggested (*P.J.* '01, i. 775) that the figure should be altered to 18·0 c.c. The *U.S.P.* requires that it should contain not less than 97 p.c. of a mixture of Acid Ammonium Carbonate and Ammonium Carbamate, and that it should yield not less than 31·58 p.c. of Ammonia gas. The method adopted by the *U.S.P.* for its volumetric determination is given in the small type below.

The more generally occurring impurities are empyreumatic and mineral matter, Lead, Copper, and Iron, Chlorides, Sulphates and Thiosulphates.

The presence of empyreumatic or non-volatile matter is detected by the appearance and odour of the residue left on the evaporation of the neutralised salt, and by any residue left upon gentle ignition. The test with Silver Nitrate Solution for Thiosulphate and limit of

Chloride is peculiar to the *P.G.* and *U.S.P.* A 1 in 20 aqueous solution of the salt when rendered faintly acid by the addition of Hydrochloric Acid should not be affected by Hydrogen Sulphide Solution, indicating the absence of Lead and Copper; nor on the subsequent addition of Ammonia Solution should it be darkened in colour, indicating the absence of Iron. A standard of 5 parts per 1,000,000 has been suggested (*C.D.* '08, i. 795) as a standard for Lead, Arsenic not having been found in this chemical. Chlorides, Sulphates and Thiosulphates may be detected, if present, by the tests with Silver Nitrate Solution and Barium Nitrate or Chloride Solution given in the small type below. The *P.G.* includes a test for Calcium, and requires that a 1 in 20 aqueous solution should be unaffected by Ammonium Oxalate Solution. It also gives a test with Ferric Chloride Solution, requiring that a 1 in 20 aqueous solution of the salt should not be coloured red on the addition of Ferric Chloride Test-solution.

Residue.—On heating, Ammonium Carbonate is volatilised, and should leave no residue, *B.P.*, *P.G.*, and *U.S.P.* If an aqueous solution (1 gramme of the salt, *P.G.* and *U.S.P.*) be supersaturated with Nitric Acid, and evaporated to dryness, the residue should be colourless and odourless, *B.P.*, *P.G.*, and *U.S.P.*, and on gentle ignition should be completely volatilised, *P.G.* and *U.S.P.*

Silver Nitrate Solution.—An aqueous solution (1–20) of Ammonium Carbonate should neither assume a brown colour, nor become more than slightly opalescent within two minutes, on the addition of Silver Nitrate Solution and subsequent supersaturation with Nitric Acid, indicating the absence of Thiosulphate and limit of Chloride, *P.G.* and *U.S.P.*

Barium Nitrate or Barium Chloride Solution. — An aqueous solution (1 in 20) should be unaffected by Barium Nitrate Solution, *P.G.*; or by Barium Chloride Solution, *U.S.P.*

Volumetric Determination.—2 grammes of the unaltered translucent salt, dissolved in a mixture of 50 c.c. each of Water and Normal V.S. Sulphuric Acid, and then boiled for a few minutes to expel the liberated CO_2 should, when the solution is cooled, require not more than 12·7 c.c. of Normal V.S. Potassium Hydroxide for exact neutralisation, Litmus T.S. being used as indicator, *U.S.P.*

Preparations.

SPIRITUS AMMONIÆ AROMATICUS. Aromatic Spirit of Ammonia. *B.P.Syn.*—Spiritus Ammoniæ Compositus. Spirit of Sal Volatile.

A clear, almost colourless liquid, possessing a strong ammoniacal odour and taste. It gradually darkens on exposure to light, and on this account should be kept in well-stoppered bottles of a dark amber tint and in a cool atmosphere.

It is prepared by mixing Oil of Nutmeg, 4½ fl. drm.; Oil of Lemon, 6½ fl. drm.; Alcohol (90 p.c.), 120 fl. oz.; and Distilled Water, 60 fl. oz., and distilling until 140 fl. oz. has been collected. This portion is reserved and a further 9 fl. oz. is distilled, this second distillate is transferred to a strong, well-stoppered bottle, mixed with 8 fl. oz. of Strong Ammonia Solution and 4 oz. of Ammonium Carbonate, and allowed to stand at 60° C. (140° F.) until the Ammonium Carbonate is dissolved, when the solution is filtered into the distillate first reserved. The official directions are that 149 fl. oz. should be distilled, collecting separately and reserving the last 9 fl. oz. passing over, but it is more convenient to dissolve the Ammonium Carbonate and Ammonia in 9 fl. oz. of Water while the distillation is proceeding, and not to carry it past 140 fl. oz.

Medicinal Properties.—Similar to those mentioned under Ammonium Carbonate. A domestic remedy for nervous headache, more useful when combined with Ammonium Bromide.

Dose.—20 to 40 minims = 1·2 to 2·4 c.c., for repeated administration; for a single administration, 60 to 90 minims = 3·6 to 5·3 c.c.

Foreign Pharmacopœias.—(Spiritus Ammoniæ Aromaticus) Jap., Ammonium Carbonate 40, Ammonia Water 100, Oil of Lemon 8, Oil of Cloves 1, Oil of Lavender 1, Alcohol 650, Distilled Water 200; U.S., Ammonium Carbonate 34, Ammonia Water 90, Oil of Lemon 10, Oil of Lavender 1, Oil of Cloves 1, Alcohol 700, Distilled Water, *q.s.* to make 1000. Neither are distilled. Port. (Esprito Ammoniacal Aromatico), *distilled*, contains Carbonate. Austr., Dan., Dutch, Ger., Hung., Ital., Norw., Russ., Span., Swed. and Swiss, have Liquor or Spiritus Ammonii Anisatus, a mixture of Oil of Anise, Spirit, and Liq. Ammon., but in slightly different proportions; Belg., a mixture of Anethol, Spirit and Liq. Ammon. *See* p. 135.

Tests.—The distinguishing tests for Spiritus Ammoniæ Aromaticus are its strong ammoniacal odour and taste; the specific gravity, which should be between 0·888 and 0·893. The addition of 16 c.c. of Barium Chloride Solution to 20 c.c. of the spirit should yield a precipitate, becoming more copious on heating to 71° C. (160° F.), and the filtrate from this precipitate should, on the addition of a further quantity of Barium Chloride Solution and again warming, again yield a precipitate.

The above test with Barium Chloride Solution is generally considered unreliable. It has been shown (*P.J.* '00, i. 147) that the precipitation of Barium Carbonate in the presence of Ammonium salts by Barium Chloride does not form a satisfactory basis for the determination of Ammonium Carbonate in the aromatic spirit, and the somewhat complicated method of measuring the Carbonic Acid gas in a nitrometer is suggested. The necessity for resorting to this latter method can be, however, obviated, as it has been pointed out (*P.J.* '00, ii. 105) that the addition of Ammonium Chloride to the solution alters the character of the precipitate altogether. A weighed quantity of 5 grammes of solid Ammonium Chloride is added to the 20 c.c. of aromatic spirit, and after vigorous agitation the requisite quantity of Barium Chloride Solution is added. The mixture is warmed to 71·1° C. (160° F.), cooled to the normal temperature and filtered. The filtrate, on the addition of more Barium Chloride Solution and warming, gives no further precipitate.

It is officially required to contain about 2·4 p.c. by weight of Ammonia gas, equivalent to 2·16 grammes in 100 c.c., as ascertained by titration with Volumetric Solution of Sulphuric Acid. The *B.P.* does not state the indicator of neutrality to be used; Methyl Orange Solution is suitable, 20 c.c. of the Spirit neutralises 25 c.c. of the Volumetric Acid.

The official test for total alkalinity is shown (*P.J.* '00, i. 145) to make no allowance for deterioration of the spirit during the process of manufacture or during storage, the latter obviously being a variable quantity, depending upon a number of variable conditions. The addition of a few c.c. per litre of the strong Solution of Ammonia is suggested in the same reference as a means of sufficiently raising the total alkalinity.

LIQUOR AMMONII ACETATIS. SOLUTION OF AMMONIUM ACETATE.

1 of Ammonium Carbonate dissolved in 10 of Distilled Water, neutralised with Acetic Acid, and diluted with Distilled Water to make 20.

This dilute solution is now prepared direct from Ammonium Carbonate as recommended in the *Companion* 1894, and the concentrated solution is omitted.

Medicinal Properties.—Diaphoretic, diuretic and slightly antipyretic. A mixture of this medicine with Spirit of Nitrous Ether forms one of the oldest remedies for febrile conditions, and, there being no risk of its producing collapse, one of the safest. Given in full doses for alcoholism.

Dose.—2 to 6 fl. drm. = 7·1 to 21·3 c.c.

Incompatibles. — Potassium and Sodium Hydroxides, and alkaline Carbonates.

Foreign Pharmacopœias.—Official in Port., sp. gr. 1·029; Fr., sp. gr. 1·036; Mex. and U.S.; all made with Carbonate; Austr., sp. gr. 1·030; Ital., 1·034; Norw., sp. gr. 1·035 to 1·040; Belg., Dutch, Ger., Hung., Jap., Russ. and Swiss, sp. gr. 1·032 to 1·034; Span., sp. gr. 1·036; all made with Caustic Ammonia.

Tests.—A clear, almost colourless fluid possessing a faint acetous odour and faint saline, acidulous but not empyreumatic taste. It should have a specific gravity of about 1·018. The *B.P.* states that a small quantity of the liquid, when deprived of its Carbonic Anhydride by heating in a test-tube, shall possess a neutral reaction to test-papers. Solution of Cochineal affords a more useful means of determining the neutrality of the solution, and obviates the necessity of boiling off the Carbonic Anhydride.

LIQUOR AMMONII CITRATIS. — SOLUTION OF AMMONIUM CITRATE.

Citric Acid 5, dissolved in Distilled Water 25, neutralised with Ammonium Carbonate, and diluted with Distilled Water to make 40.

Medicinal Properties.—Similar to Liquor Ammonii Acetatis.

Dose.—2 to 6 fl. drm. = 7·1 to 21·3 c.c.

Tests.—A clear, almost colourless and odourless liquid possessing a saline taste. It should have a specific gravity of about 1·057. The remarks upon the method of determining the neutrality of the solution appearing upon Liquor Ammonii Acetatis apply equally here.

Not Official.

LINCTUS AMMONIÆ COMPOSITUS. — Ammonium Carbonate, ⅙ grain; Ipecacuanha Wine, 2 minims; Tincture of Squill, 5 minims; Essence of Anise, 1 minim; Mucilage of Acacia, 20 minims; Water, to 1 fl. drm.—*Royal Chest.*

LIQUOR AMMONII ACETATIS FORTIOR.—Carbonate of Ammonium, 15½ oz.; Acetic Acid, 50 fl. oz. or *q.s.*; Distilled Water, *q.s.* to make 60 fl. oz.—*B.P.* 1885.

This has been incorporated in the *B.P.C.* as follows:—

Ammonium Carbonate, 25; Acetic Acid, *q.s.* to neutralise; Distilled Water, *q.s.* to make 100.

LIQUOR AMMONII CITRATIS FORTIOR.—Citric Acid, 12 oz.; Strong Solution of Ammonia, 11 fl. oz. or *q.s.*; Distilled Water *q.s.* Neutralise the acid with the Ammonia, adding sufficient Distilled Water to make 24 fl. oz.—*B.P.* 1885.

This has been incorporated in the *B.P.C.*

LIQUOR VOLATILIS CORNU CERVI, or **SPIRIT OF HARTSHORN.**—Solution of Carbonate of Ammonia of the old Pharmacopœias, distilled from Hartshorn; but is now more generally represented by Liquor Ammoniæ *B.P.*

MISTURA AMMONIÆ CUM SENEGA.—Ammonium Carbonate, 4 grains; Ipecacuanha Wine, 10 minims; Infusion of Senega, ½ fl. oz.; Water, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*, using Ammonium Carbonate 5 grains in the place of 4.

Ammonium Carbonate, 5 grains; Tincture of Squill, 12 minims; Spirit of Chloroform, 10 minims; Infusion of Senega, to make 1 fl. oz.—*Royal Free.*

HARTSHORN AND OIL.—1 of Sp. Hartshorn and 3 of Oil of Almonds.

AMMONIUM BICARBONATE.—White, crystalline powder. Soluble 1 in 5 of water, insoluble in Alcohol (90 p.c.). It is formed when Ammonium Carbonate is exposed to the air. Employed in powders and pastilles as a substitute for Ammonium Carbonate.

AMMONII CHLORIDUM.

AMMONIUM CHLORIDE.

N.O.Syn.—Ammonium Chloratum; Chloretum Ammonicum.

Fr., Chlorure d'Ammonium; Ger., Ammoniumchlorid; Ital., Cloruro di Ammonio; Span., Cloruro Amonico.

NH_4Cl, eq. 53·13.

White, odourless crystalline powder possessing a cooling saline taste. It is permanent in the air.

Solubility.—1 in 3 of Water; 1 in 55 of Alcohol (90 p.c.).

Medicinal Properties.—Stimulating expectorant in bronchitis by inhalation, or by allowing it to dissolve slowly in the mouth in the form of lozenge or tablet; is a hepatic, gastric and intestinal stimulant, diaphoretic and diuretic. In neuralgia, lumbago and migraine, in doses of 20 to 30 grains three times a day, it frequently relieves after four or five doses. Useful in sciatica, gout and chronic rheumatism; in acute and chronic congestion of the liver; said to counteract the tendency to albuminoid degeneration.

Recommended in advanced cases of pulmonary phthisis to facilitate expectoration.—*L.* '95, ii. 1524.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Prescribing Notes.—*Generally taken in solution; can be dispensed in the form of* **mixtures, powders,** *or Compressed Tablets. Lemon and Chloroform make it more palatable.* See *below*, *Haustus.*

Fluid Extract of Liquorice has been recommended, but many persons object to the taste of Liquorice.

10 *grains in a claret-glassful* (3 *fl. oz.*) *of cold Water, sipped frequently, allays distressing fits of coughing in bronchitis.*

The **vapour** *is also largely employed in naso-pharyngeal and eustachian catarrh; various kinds of inhalers have been introduced for mixing the vapours of Hydrochloric Acid and Ammonia. In the absence of such an inhaler, heat a small quantity of the solid salt in an iron spoon or any convenient dish over a spirit lamp and inhale the fumes.*

Incompatibles.—Alkalis and their Carbonates; alkaline earths; Lead and Silver salts.

Official Preparation.—Used in the preparation of Liquor Ammoniæ Fortis.

Not Official.—Draught, Lotion and Lozenges.

Foreign Pharmacopœias.—Official in Austr., Belg., Ger., Hung., Jap., Russ. and Swiss (Ammonium Chloratum); Dan., Dutch, Norw. and Swed. (Chloretum Ammonicum); Fr. (Chlorure d'Ammonium); Ital. (Cloruro di Ammonio); Mex. (Cloruro de Amonio); Port. (Chloreto de Ammonio); Span. (Cloruro Amonico); U.S. (Ammonii Chloridum).

Tests.—The distinguishing tests for Ammonium Chloride are the evolution of Ammonia when the salt is heated with Potassium or Sodium Hydroxide Solution and the production of a yellowish-brown coloration when a sufficiently diluted solution of the salt is treated with Potassio-mercuric Iodide (Nessler's) Solution, the depth of colour varying with the dilution of the solution; the formation of a white curdy precipitate, insoluble in Nitric Acid, but soluble in Ammonia Solution or Potassium Cyanide Solution, when Silver Nitrate Solution is added to its aqueous solution. When heated it evolves dense white fumes and volatilises completely.

Neither the *B.P.* nor the *P.G.* records a volumetric method for the determination of the salt, but a process which is described below is given in the *U.S.P.*, the latter Pharmacopœia stipulates that the salt shall contain not less than 99·5 p.c. of the pure salt.

The more generally occurring impurities are Calcium, Copper, Iron, Lead, Carbonates and Sulphates. These impurities may be detected, if present, by the tests given in the small type below under the respective headings of Ammonium Oxalate Solution, Hydrogen Sulphide, Barium Nitrate or Chloride Solution, and Diluted Sulphuric Acid. The *U.S.P.* and *P.G.* include a separate test for Iron, which is described in the small type under the heading of Potassium Ferrocyanide Solution. It may also contain Thiocyanates. The test for the latter is carried out with Ferric Chloride Test-solution, using according to the *B.P.* an aqueous solution, according to the *U.S.P.* and *P.G.* an aqueous solution acidulated with Hydrochloric Acid.

A standard of 5 parts of Lead per 1,000,000 is suggested (*C.D.* '08, i. 795) and 2 parts per 1,000,000 as a standard for Arsenic.

Hydrogen Sulphide.—An aqueous solution (1–20 *P.G.*) should not be affected by Hydrogen Sulphide Solution, neither should it respond to the time-limit test for heavy metals, *U.S.P.*

Barium Nitrate or Chloride Solution.—An aqueous 1 in 20 solution should be unaffected by Barium Nitrate Solution *P.G.*; by Barium Chloride T.S., *U.S.P.*

Diluted Sulphuric Acid.—An aqueous 1 in 20 solution should be unaffected by diluted Sulphuric Acid, *P.G.* and *U.S.P.*

Ammonium Oxalate Solution.—An aqueous 1 in 20 solution should be unaffected by Ammonium Oxalate Solution, *P.G.* and *U.S.P.*

Potassium Ferrocyanide Solution.—20 c.c. of a 1–20 solution should not immediately turn blue with 0·5 c.c. Potassium Ferrocyanide Solution, *P.G.*; *U.S.P.* uses 5 drops of the reagent.

Volumetric Determination.—10 c.c. of a solution obtained by dissolving 1 gramme of Ammonium Chloride in sufficient Water to measure 100 c.c., should, after the addition of 5 drops Potassium Chromate T.S., require not less than 18·7 c.c. of Tenth-normal Volumetric Silver Nitrate Solution to produce a permanent red colour, *U.S.P.*

Not Official.

HAUSTUS AMMONII CHLORIDI.—Ammonii Chloridi, gr. xv.; Tinct. Limon., ♏xlv.; Sp. Chloroformi, ♏x.; Aquæ, ad ℥iss.

LOTIO AMMONII CHLORIDI.—1 oz. with 1 fl. oz. Alcohol (90 p.c.) and 10 fl. oz. Water. Vinegar is sometimes added, to be applied as a dressing for bruises.

TROCHISCI AMMONII CHLORIDI.—2 grains = 0·13 gramme, in each, with Black Currant Paste, are much used for bronchitis.

Dose.—2 to 4 lozenges.

These have been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in Belg., Dutch and U.S.

Each lozenge contains about 2 grains of Ammonium Chloride (with Black Currant Paste.—*Throat.*

Ammonium Chloride, 10; Extract of Glycyrrhiza, 20; Tragacanth, in fine powder, 2; Sugar, 40, in grammes; Sugar of Tolu, *q.s.* to make 100 troches.—*U.S.P.*

Trochisci Ammonii Chloridi cum Glycyrrhiza.—Ammonium Chloride, 3 grains; Liquorice Extract, 3 grains in each.—*Martindale.*

This has been incorporated in the *B.P.C.*

Not Official.

AMMONII IODIDUM.

AMMONIUM IODIDE.

FR., IODURE D'AMMONIUM; GER., AMMONIUM JODATUM; ITAL., YODURO DI AMMONIO; SPAN., YODURO AMMONICO.

A white granular deliquescent salt, or in cubical crystals, readily becoming yellow on exposure to air.

The salt possesses practically no odour unless highly coloured, when a faint odour of Iodine is perceptible, and it has a sharp saline taste.

When deeply coloured, it is advisable in dispensing to remove the colour by shaking it in a bottle with a piece of Ammonium Carbonate. It has been pointed out that the resulting Iodate would be decomposed by the Hydrochloric Acid of the stomach, and result in the re-formation of free Iodine; but as the quantity would generally be very small it may be disregarded.

The *U.S.P.* uses Ammonium Sulphide Test-solution for decolorising a deeply coloured salt. Sufficient of the solution to decolorise it being added to a concentrated solution, the liquid filtered and evaporated to dryness.

It should be kept in well-stoppered glass bottles of a dark amber tint.

Solubility.—4 in 3 of Water; 1 in 3 of Alcohol (90 p.c.); 3 in 4 of Glycerin.

Medicinal Properties.—Similar to the Potassium Iodide, but less depressing.

Dose.—2 to 5 grains =0·13 to 0·32 gramme, three times a day; but much larger doses can be given.

Foreign Pharmacopœias.—Official in Fr., Mex., Port., Russ., Span. Swiss and U.S. Not in the others.

Tests.—The salt answers the usual distinguishing tests for Ammonium salts, it evolves Ammonia when heated with Potassium of Sodium Hydroxide Solution, and yields a brownish-yellow coloration on the addition of Potassio-mercuric Iodide (Nessler's) Solution to its extremely dilute aqueous solutions. The addition of Chlorine water to its aqueous solution liberates Iodine, and a violet-coloured solution is given when this aqueous liquid is shaken with Carbon Bisulphide. Silver Nitrate Solution produces a curdy yellow precipitate, which is insoluble in Nitric Acid, practically insoluble in Ammonia Solution, but soluble in Potassium Cyanide Solution.

The more generally occurring impurities are heavy metals, *e.g.*, Arsenic, Copper and Lead, Barium, Iron, excess of free Iodine, and excess of Chlorides or Bromides. The presence of heavy metals is readily detected by Hydrogen Sulphide Solution, Barium by means of a solution of Potassium Sulphate. A limit of Iron is fixed by the requirement that the addition of Potassium Ferrocyanide Solution to an aqueous 1 in 150 solution of the salt should not immediately produce a blue colour. An aqueous 1 in 150 solution when shaken with 1 c.c. of Chloroform should not impart a violet colour to the chloroformic liquid, indicating the absence of excess of free Iodine. A 5 p.c. aqueous solution when acidified with Nitric Acid should neither yield a turbidity or precipitate on the addition of either Silver Nitrate or Barium Chloride Solution, indicating the absence of Chlorides and Sulphates.

In testing for excess of Chlorides or Bromides the *U.S.P.* dissolves 0·25 gramme of the salt, dried at 100° C. (212° F.), in 5 c.c. of Ammonia Solution, shakes with 16·9 c.c. of Deci-normal Volumetric Solution of Silver Nitrate and saturates the filtrate with 5 c.c. of Nitric Acid. The absence of a cloudiness within 10 minutes indicates the absence of more than 3 p.c. of Chlorides and Bromides.

AMMONII PHOSPHAS.

AMMONIUM PHOSPHATE.

$(\mathbf{NH_4})_2\ \mathbf{HPO_4}$, eq. 131·20.

White, odourless, glistening, prismatic crystals, having a saline taste.

It may be prepared by neutralisation of Orthophosphoric Acid with Ammonia Solution, the presence of the requisite amount of Ammonia being ensured by the addition of solid Ammonium Carbonate when necessary during the evaporation. It should be preserved in well-stoppered bottles.

Solubility.—1 in 2 of Water, and measures 2½; insoluble in Alcohol (90 p.c.).

A salt corresponding to the official formula has been stated by some authorities to have a solubility of 1 in 0·76; the true figure, however, for the normal *B.P.* salt is 1 in 2, and this figure was given in the *Companion* from the 1st edition to the 15th (1890).—*C.D.*, '03, i. 944; *P.J.*, '03, i. 65.

Medicinal Properties.—Given in chronic rheumatism and in the gouty and uric acid diathesis to render the Sodium Biurate more soluble, and to prevent formation of Uric Acid calculi.

Dose.—5 to 20 grains = 0·32 to 1·3 grammes.

Prescribing Notes.—*It is given 3 or 4 times a day in Water, but should* *not be prescribed in too condensed a form when tinctures form part of the mixture, on account of its sparing solubility in spirituous menstrua.*

Foreign Pharmacopœias.—Official in Port. Not in others.

Tests.—The distinguishing tests for Ammonium Phosphate are that it evolves Ammonia when heated with Potassium or Sodium Hydroxide Solution; its aqueous solution when sufficiently diluted yields a yellowish-brown coloration with Potassio-mercuric Iodide (Nessler's) Solution; an aqueous solution yields with Silver Ammonio-nitrate Solution a pale yellow precipitate readily soluble in Ammonia Solution and in cold diluted Nitric Acid; Ammonium Molybdate Solution when added to an aqueous solution containing an excess of Nitric Acid yields a yellow precipitate soluble in Ammonia Solution; and Magnesium Ammonio-sulphate Solution added to its aqueous ammoniacal solution affords a white crystalline precipitate soluble in dilute mineral acids. The latter test forms the basis of the *B.P.* method for the gravimetric determination of the salt, and it is required that when 2 grammes are precipitated with Magnesium Ammonio-sulphate Solution, the precipitate washed with Ammonia Solution diluted with an equal volume of water, suitably dried and heated to redness, shall weigh 1·680 grammes. This corresponds to 99·68 p.c. of Di-ammonium Mono-hydrogen Ortho-phosphate. It must be pointed out that unless the precautions mentioned at the commencement of the monograph on this article are observed, a salt yielding this amount of precipitate will not be obtained. Most 'commercial' samples are mixtures of Di-ammonium Mono-hydrogen Ortho-phosphate (the official salt) and Mono-ammonium Di-hydrogen Ortho-phosphate (the Acid Ammonium Phosphate).

Six commercial samples examined in the author's laboratory, when assayed by the process described in the *B.P.*, yielded precipitates varying in weight from 1·686 grammes to 1·818 grammes, the former being the only one of the six that approximated a salt of the Pharmacopœia formula. Greenish and F. A. Upsher Smith, from an examination of two commercial samples, neither of which yielded the official weight of precipitate, concluded (*P.J.* '01, i. 777) that it appeared unlikely that an absolutely normal salt could be found in commerce and accepted the second sample for the determination of its solubility, as the best that could be furnished commercially. Later (*P.J.* '03, ii. 948), whilst confirming the investigations into the composition of commercial samples of the salt recorded in the author's paper (*C.D.* '02, ii. 944; *P.J.* '03, i. 65), Greenish's further experiments have convinced him that there is no material difficulty in preparing a salt of the composition demanded by the Pharmacopœia.

The more generally occurring impurities, other than the Acid Phosphate, are Arsenic, Copper and Lead, Iron, Chlorides, and Sulphates. Of those the most important and the most likely are Arsenic and Lead, the former is readily detected by the modified Gutzeit's test, the latter by Hydrogen Sulphide Solution.

A standard of 5 parts per 1,000,000 for Arsenic and 10 parts per 1,000,000 for Lead fs suggested (*C.D.* '08, i. 795). A 1 in 20 aqueous solution when acidified with diluted Nitric Acid should yield no turbidity on the addition of Silver Nitrate Solution, indicating the absence of Chlorides. A solution of similar strength when acidified with Hydrochloric Acid should yield no turbidity on the addition of Barium Chloride Solution, indicating the absence of Sulphates.

Not Official.

AMMONIUM SALICYLATE.—White, odourless, crystalline powder, or in odourless white needle-shaped crystals. It may be prepared with either the natural or the physiologically pure Salicylic Acid. It should be kept in well-stoppered glass bottles of a dark amber colour and kept in a cool atmosphere. Antipyretic and antirheumatic, but is largely superseded by the Sodium salt.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Foreign Pharmacopœias.—Official in Dutch, Russ. and U.S. Not in the others.

Tests.—It evolves Ammonia when warmed with Potassium or Sodium Hydroxide Solution, and its dilute aqueous solution yields with Ferric Chloride Test-solution a deep violet coloration.

A small quantity of the salt warmed with concentrated Sulphuric Acid and a few c.c. of Methyl Alcohol evolves the characteristic odour of Methyl Salicylate.

Its sufficiently concentrated aqueous solution yields a white crystalline precipitate when acidified with a mineral acid; the precipitate when washed and collected should possess the melting point 156° to 157° C. (312·8° to 314·6° F.) of pure Salicylic Acid, and should otherwise conform to the tests for purity of the acid.

The more generally occurring impurities are heavy metals, *e.g.*, Copper and Lead, which are likely to be present in Salicylic Acid and mineral matter. The presence of heavy metals is readily detected by adding Hydrogen Sulphide Solution to the acidified, filtered, aqueous solution; impure Salicylic Acid is indicated by the melting point above described, and absence of mineral matter by the complete volatilisation of the salt on heating.

AMMONIUM VALERIANATE.—Colourless, deliquescent, flat prismatic crystals, possessing a sweetish taste and a strong odour of Valerianic Acid.

It should be kept in well-stoppered glass bottles of a dark amber colour and in a cool atmosphere.

Readily soluble in Water and Alcohol; soluble in Ether.

Stated to be useful in hysteria, epilepsy and neuralgia.

Dose.—1 to 3 grains = 0·065 to 0·2 gramme, several times daily. Given in form of pills or in solution.

Foreign Pharmacopœias.—Official in Fr., Mex., Span., Swiss and U.S. Not in the others.

Tests.—The salt evolves Ammonia when heated with Potassium or Sodium Hydroxide Solution; when heated it fuses, evolving an odour of Ammonia and of Valerianic Acid, and when heated to a still higher temperature, it is completely volatilised; when warmed with diluted Sulphuric Acid the odour of Valerianic Acid is emitted. The *U.S.P.* requires that it shall contain not less than 98 p.c. of pure Ammonium Valerianate.

The more generally occurring impurities are heavy metals, *e.g.*, Lead and Copper and Acetates. The presence of the former is readily detected by adding Hydrogen Sulphide Solution to the acidified aqueous solution; the presence of the latter by supersaturating the aqueous solution with Ferric Chloride Test-solution and filtering; the filtrate should not possess a red colour. Solutions of the salt exhibit an acid reaction to blue Litmus paper.

AMMONIUM VALERIANATUM SOLUTUM (Liquor Ammonii Pierlot), *Swiss.*—Valerianic Acid, 3; Extract Valerian, 2; Water, 95; Ammonium Carbonate, sufficient to neutralise.

In hysteria and epilepsy 6 to 30 drops in sweetened Water. Given in the form of the above solution in the treatment of the morphine habit.—*L.* '01, ii. 363.

AMYGDALA AMARA.

BITTER ALMOND.

FR., AMANDES AMÈRES; GER., BITTERE MANDELN; ITAL., MANDORLE AMARE; SPAN., ALMENDRA AMARGA.

The ripe Seed of *Prunus Amygdalus*, Stokes, var. *amara*, Baillon.

Introduced only as a source of Almond Oil, and from which the commercial product is chiefly obtained.

Foreign Pharmacopœias.—Official in all the Foreign Pharmacopœias except Dutch; Port. (Amendoas Amargas).

Not Official.—Aqua Amygdalæ Amaræ, Mistura Amygdalæ Amaræ, Oleum Amygdalæ Amaræ Essentiale, and Oleum Amygdalæ Essent. Persic of the Essential Oil, Spiritus Amygdalæ Amaræ, Syrupus Amygdalæ.

Descriptive Notes.—The bitter almonds of commerce are chiefly obtained from Barbary (Morocco) and Sicily, and are distinguished by their bitter taste and the characteristic odour of the aqueous emulsion. The *U.S.P.* gives the measurement of the seed as 20 to 30 mm. long, and oblong, lanceolate or ovate in form, and the *P.G.* as 2 cm. long and 1 to 2 cm. broad, and states that the seed should not have a rancid taste.

Apricot and peach kernels which are imported for making an inferior almond oil are much smaller than bitter almonds, which they resemble in taste.

AMYGDALÆ OLEUM. ALMOND OIL.

The fixed oil expressed from the Bitter or Sweet Almond, the yield being between 40 and 45 p.c.

Descriptive Notes.—A clear pale yellow, odourless oily liquid possessing a bland, nutty taste. The almond oil of commerce is obtained chiefly from the bitter almond by expression, and is known in commerce as English oil. The oil formerly sold under the name of Ol. Amygd. Exot., but now as Ol. Amygd. Persic, is derived from Peach and Apricot kernels; recently Oil of Poppy Seed has been offered under the name of Peach Kernel Oil.

Solubility.—Only slightly soluble in Alcohol (90 p.c.), entirely soluble 1 in 2¼ of Ether, and in all proportions of Chloroform.

Medicinal Properties.—Emollient, demulcent and laxative. As an enema in impaction of fæces or obstruction of bowel, 1 to 3 pints.

Dose.—1 to 4 fl. drm. = 3·6 to 14·2 c.c.

Prescribing Notes.—1 *fl. oz. of Oil, with ½ fl. oz. Mucilage, ¼ oz. Sugar, and* 6 *fl. oz. of Distilled Water, makes a nice cough mixture.*

A mixture of equal parts of this Oil and Lime Water, with a small proportion of Glycerin, scented with Lemon, has been commonly sold under the title **Glycerin and Lime Juice.**

Official Preparations.—Contained in Linimentum Ammoniæ, Oleum Phosphoratum, Unguentum Aquæ Rosæ, and Unguentum Cetacei.

Used in preference to Olive Oil, as it makes a whiter ointment and is less liable to become rancid.

Foreign Pharmacopœias. Official in Austr., Belg., Dan., Dutch, Fr. (Huile d'Amande), Ger. (Mandelol), Hung., Ital. (Olio di Mandorle Dolci), Jap., Mex., Norw., Port., Russ., Span. (Aceite de Almendras Dulces), Swed., Swiss and U.S.

Tests.—The distinguishing tests for Almond Oil are the specific gravity which should be from 0·915 to 0·920, the congealing point which is about −20° C. (−4° F.). These tests, with an Elaïdin test for Peach Kernel and other fixed Oils, are as far as the official volume takes us. The above specific gravity is given by *B.P.* and *P.G.*; the *U.S.P.* gives 0·910 to 0·915 at 25° C. (77° F.). The *U.S.P.* and some of the recent editions of the Continental Pharmacopœias include figures for the Saponification value and Iodine absorption. The Saponification value is the number of milligrammes of Potassium Hydroxide Solution required to neutralise 1 gramme of the oil. The Iodine absorption is the percentage of Iodine which the oil absorbs. The Austr. Ph. requires a Saponification value of 190–195 and an Iodine absorption of 94–100 p.c.; the Belgian Ph., a Saponification value of not less than 185, and an Iodine absorption of 92–102 p.c. The *U.S.P.*, a Saponification value of 191–200 and an Iodine absorption of not less than 95 nor more than 100; the Dutch Ph. omits the Saponification value, but gives an Iodine absorption of not less than 95 nor more than 101. Twelve good commercial samples examined in the author's laboratory showed a Saponification value of 190·4 to 196·4, and an Iodine absorption of 95·3 to 100·3.

The more generally occurring impurities are Peach and Apricot Kernel Oils (which much resemble Almond Oil, and are known commercially as Ol. Amygdalæ Persic); and other fixed oils, *e.g.*, Arachis, Cotton Seed, Olive and Sesame. The Elaïdin test for these, which is given in small type below under the heading of Nitric Acid, is common to *B.P.*, *U.S.P.* and *P.G.* The two latter Pharmacopœias, moreover, include an additional, almost identical, test for the detection of fixed oils other than Almond Oil, which is given in small type below under the heading of Saponification, and which depends upon the production of a clear solution when the saponified alcoholic solution is diluted with Distilled Water; the Oleic Acid obtained from this solution on acidification, when washed and clarified, is required to remain liquid at 15·5° C. (60° F.), and when mixed with an equal volume of Alcohol of the respective pharmacopœial strengths to yield a clear solution which does not deposit at 15° C. (60° F.) nor become turbid on a further addition of one volume of Alcohol.

Nitric Acid.—If 2 c.c. of the Oil be well shaken with 1 c.c. of fuming Nitric Acid and 1 c.c. of water, a whitish, not brownish, red mixture should be formed which, after standing for 6 hours at about 50° F. (10° C.) (for 2 or at most 6 hours *P.G.*, for some hours *U.S.P.*), should separate into a solid white mass and a nearly colourless liquid, *B.P.*, *P.G.*, and *U.S.P.* The *U.S.P.* states that the fixed Oils of Peach and Apricot kernels give a red colour and Sesame and Cotton Seed Oils give a brown colour.

Saponification.—If 10 c.c. of the Oil be mixed with 15 c.c. of a Sodium Hydroxide Solution (1–6, *U.S.P.*; sp. gr. 1·168 to 1·172, *P.G.*), and 10 c.c. of Alcohol, and the mixture be allowed to stand (at a temperature of 35° to 40° C. (95° to 104° F.) with occasional agitation, *U.S.P.*) until it becomes clear, and if then diluted with 100 c.c. of Water, the clear solution thus obtained upon the subsequent addition of an excess of Hydrochloric Acid will set free a layer of Oleic Acid. This when separated from the aqueous liquid, washed with warm Water, and clarified by heating on a water-bath will remain liquid if cooled to 15° C. (59° F.), *P.G.* and *U.S.P.* 1 volume of this Oleic Acid when mixed with 1 volume of Alcohol should yield a clear solution which at 15° C. (59° F.) should not deposit any fatty acids, nor become turbid upon the further addition of 1 volume of Alcohol, *P.G.* and *U.S.P.*

Iodine Absorption.—If 0·3 gramme of expressed Oil of Almonds be dissolved in 10 c.c. of Chloroform in a 250 c.c. flask and 25 c.c. of a mixture of equal volumes of Alcoholic Iodine T.S. and Alcoholic Mercuric Chloride T.S. added, and if, after standing for four hours protected from light, 20 c.c. of Potassium Iodide T.S. be introduced and the mixture diluted with 50 c.c. of Water, on titrating the excess of Iodine with V.S. of Tenth-normal Sodium Thiosulphate an Iodine value of not less than 95 nor more than 100 should be obtained, *U.S.P.* The *P.G.* test uses 0·5 gramme of Oil, and directs the addition of 1·5 grammes of Potassium Iodide and 100 c.c. of Water before titration.

Not Official.

AQUA AMYGDALÆ AMARÆ.—Prepared by crushing Bitter Almonds and expressing the fixed Oil, and then distilling the residual cake with Water so that it shall contain the proper quantity of Hydrocyanic Acid ordered in any particular Pharmacopœia.

Ph. Ger. maximum single dose, 2 grammes; maximum daily dose, 6 grammes.

Foreign Pharmacopœias.—Official in the following, the percentage of Hydrocyanic Acid also given: Dan. (Conc.), 0·1 p.c., (Dil.) 0·005 p.c.; Ger., Hung., Ital., Jap., Russ. and Swed., 0·1 p.c.; Norw., 0·1 p.c.; Port., not standardised; U.S., not standardised, 1 Volatile Oil in 1000; Austr., Belg. and Swiss use Laurocerasi Water when Bitter Almond Water is prescribed. Not in the others.

The *Brussels Conference* adopts a strength of 0·1 p.c. for Aqua Amygdalæ Amaræ.

MISTURA AMYGDALÆ AMARÆ.—Made in the same proportions as Mistura Amygdalæ.

Useful in cough, and as a lotion to allay itching of the skin. It was a favourite vehicle for giving Tartarated Antimony, in doses of ⅛ grain = 0·008 gramme, as a sedative expectorant in the first stage of acute bronchitis or pneumonia. The mixture contains a variable amount of Hydrocyanic Acid.

Dose.—½ to 1½ fl. oz. = 14·2 to 42·6 c.c.

Mistura Amygdalæ Amaræ.—Bitter Almonds, 8; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

OLEUM AMYGDALÆ AMARÆ ESSENTIALE.—A clear, colourless or pale yellowish, highly refractive liquid, with a characteristic odour, and a bitter and somewhat burning taste. Obtained from Bitter Almonds by macerating with Water the cake from which the fixed Oil has been expressed, and subsequent distillation.

It should be kept in well-stoppered glass bottles of a dark amber colour, and as far as possible from contact with air.

Chiefly used as a flavouring agent, when the oil 'sine Acido Hydrocyanico' should be employed.

Ol. Amygdal. Essent. Persic is prepared by a similar process to Bitter Almond Oil, from the kernels of the Apricot and Peach.

Solubility.—Sparingly in Water: mixes in all proportions with Alcohol (90 p.c.) and Ether.

Foreign Pharmacopœias.—Official in Belg. (Aldehydum Benzoicum), Fr., Mex. (Aceite Volatil de Almendras Amargras), Port., Span. and U.S. U.S. has also Benzaldehyde. Not in the others.

U.S. has also Spiritus Amygdalæ Amaræ, 1 in 100.

Tests.—The distinguishing tests for Bitter Almond Oil are the strong and distinctive odour; the high refraction; the specific gravity which after removal of Hydrocyanic Acid should be from 1·045 to 1·050; the boiling point, which should be 179° to 180° C. (354·2° to 356° F.); and its optical inactivity. The Oil is converted into a crystalline compound when shaken with a saturated Solution of Sodium Bisulphite, and this reaction may be utilised as a means for its quantitative determination, the non-aldehydic constituents can be measured or weighed. The *U.S.P.* process is essentially as follows:—A measured quantity of 10 c.c. of purified Kerosene is introduced into a tared 150 c.c. flask and the exact weight recorded, 12 drops of the Oil are then added and the weight again recorded; 20 c.c. of Distilled Water and 6 drops of Rosolic Acid Test-solution are added and the mixture exactly neutralised with Tenth-normal Volumetric Sodium Hydroxide Solution, agitating the flask thoroughly. A 1 in 5 aqueous solution of Sodium Sulphite alternated with Half-normal Volumetric Hydrochloric Acid Solution is added until 10 c.c. of the Sodium Sulphite Solution have been added, and sufficient Half-normal Volumetric Hydrochloric Acid Solution to maintain the neutrality of the mixture; after the addition of a few drops of Rosolic Acid Test-solution, the flask is agitated frequently, allowed to stand for 2 hours to ensure a permanent condition of neutrality, and the number of c.c. of Half-normal Volumetric Hydrochloric Acid Solution required noted. A blank test is carried out alongside of the determination, the number of c.c. of Half-normal Volumetric Hydrochloric Acid Solution is noted, the number of c.c. used in the latter is subtracted from that required in the former, the difference is multiplied first by 0·0526 and the product by 100 and divided by the weight of Oil taken yields a percentage of Benzaldehyde present in the sample.

The more generally occurring impurities are acidity, Hydrocyanic Acid, artificial Benzaldehyde, and Nitrobenzine. Acidity may arise from atmospheric oxidation of Benzaldehyde to Benzoic Acid, and may be determined with Deci-normal Volumetric Sodium Hydroxide Solution. If the Oil contains a crystalline deposit of acid it should not be used.

Hydrocyanic Acid can be detected by shaking 10 or 15 drops of the Oil with 2 to 3 drops of Potassium or Sodium Hydroxide Solution, adding a few drops of Ferrous Sulphate Solution containing a drop or two of Test-solution of Ferric Chloride, warming and slightly acidifying with dilute Hydrochloric Acid, when a blue precipitate will be produced if this acid be present.

Hydrocyanic Acid may be estimated volumetrically by weighing 1 gramme into a small flask, adding a sufficiency of freshly precipitated (Chloride free) Magnesium Hydroxide and Water, several drops of Potassium Chromate Solution and Deci-normal Volumetric Solution of Silver Nitrate until a permanent red coloration is produced. The oil generally employed in this country is free from this acid, but *U.S.P.* allows not less than 2 p.c. nor more than 4 p.c. The presence of Chlorine compounds is generally held to be indicative of artificial Benzaldehyde, but the failure to find them does not necessarily imply that the specimen is free from 'artificial Benzaldehyde' as the latter is now produced commercially of very fine quality.

Chlorine compounds are examined for as follows:—A folded strip of filter paper saturated with oil is placed in a small porcelain capsule standing within a larger one and ignited. A large beaker, the sides of which have been moistened with Water, or preferably containing filter paper (free from Chlorides) moistened with Water, is inverted over the burning Oil. The products of combustion condense on the moistened surface of the beaker or on the filter paper, and can be washed on to a filter with a little Distilled Water. The filtrate should show no turbidity on the addition of Silver Nitrate Solution, or if a turbidity is produced it should disappear on warming. The presence of Nitrobenzene (now an unlikely impurity) may be detected by diluting the Oil with 20 times its volume of Alcohol (90 p.c.), diluting the solution with Water until a turbidity is produced, adding Zinc and Sulphuric Acid, allowing the solution to remain at rest several hours, filtering, evaporating the Alcohol, and treating the remaining solution with a drop of Potassium Bichromate Solution. The production of a violet colour indicates the presence of Aniline.

SPIRITUS AMYGDALÆ AMARÆ.—Oil of Bitter Almond, 1; Alcohol (95 p.c.), 80; Distilled Water, *q.s.* to make 100.—*U.S.P.*

This spirit contains a trace of Hydrocyanic Acid and should always be used with care.

This has been incorporated in the *B.P.C.* as follows:—

Oil of Bitter Almond (sine Acid. Hydrocyanic.), 1; Alcohol (90 p.c.), 85; Distilled Water, *q.s.* to produce 100.

SYRUPUS AMYGDALÆ.—Spirit of Bitter Almond, 1; Orange Flower Water, 10; Syrup, *q.s.* to make 100.—*U.S.P.*

This has been incorporated in the *B.P.C.*

AMYGDALA DULCIS.

SWEET ALMOND.

FR., AMANDES DOUCES; GER., SÜSSE MANDELN; ITAL., MANDORLE DOLCI; SPAN., ALMENDRO DULCE.

The ripe Seed of *Prunus Amygdalus*, Stokes, var. *dulcis*, Baillon. Commonly known as the Jordan Almond.

Medicinal Properties.—Demulcent and nutrient. Biscuits are made of Jordan and Valencia Almonds for diabetic patients, as a substitute for bread or starchy food. Almonds do not contain starch.

The Mistura Amygdalæ is a good vehicle for cough medicines, and for suspending insoluble powders.

Official Preparations.—Mistura Amygdalæ and Pulvis Amygdalæ Compositus.

Foreign Pharmacopœias.—Official in all; Fr., Ital., Mex. (Almendra Dulce), Port. (Amendoas Doces), Span.

Descriptive Notes.—Almonds are met with in commerce either in the shell or endocarp, or in the form of seed only. Sweet Almonds vary in size and shape, those of Valencia and Sicily being broad and flattened, those of Barbary irregular in shape owing to two seeds often occurring in one endocarp and becoming misshapen by pressure. The Valencia Almonds are usually free from Bitter Almonds, those of Barbary and Sicily are often mixed with them. The Jordan Almond, which is alone official, is imported from Malaga in Spain. It is longer, narrower and more convex in proportion than the other varieties, being 2·5 to 3 cm. (about an inch) in length, and about 1·25 cm. (½ inch) in width and 0·5 cm. (⅕ inch) in thickness. It has a bland taste and triturated with Water forms a white emulsion without any marked odour, indicating the absence of Bitter Almonds. For forming emulsions, Almonds are first deprived of their skins or 'blanched' by dipping them in boiling Water for a minute or two, when slight pressure between the fingers will separate the testa. The variety official in the *U.S.P.* appears to be the Valencia Almond as it is stated to be broader than the Bitter Almond. The variety official in Germany is stated to be unsymmetrically ovate and flattened, 2·25 cm. long and 1·5 cm. broad, and at the rounded end more than 1 cm. broad. This appears to indicate the Sicilian or Valencia Almonds, since the Jordan Almonds are rarely more than 1·25 cm. broad.

Preparations.

MISTURA AMYGDALÆ. Almond Mixture.

Compound Powder of Almonds, 1; Distilled Water, 8.

Rub the powder to a smooth cream with a suitable quantity of Water, and add gradually the remainder; strain.

Dose.—$\frac{1}{2}$ to 1 fl. oz. = 14·2 to 28·4 c.c.

Foreign Pharmacopœias.—Official as **Emulsio** in Austr., Dan., Fr., Hung., Ital., Norw., Port. and Swed. U.S. Emulsum A.; there is much variation in the proportions. Swed. has also Emulsio Hydrocyanata, Aymgdalin, 1; Almond Emulsion, 80. Not in the others. Belg., Fr., Ger. and Swiss have Syrups.

PULVIS AMYGDALÆ COMPOSITUS.—Compound Powder of Almonds.

Sweet Almonds, 8; Powdered Refined Sugar, 4; Powdered Gum Acacia, 1. Remove the skins of the Almonds after softening them in Water, and dry the Almonds by a cloth and exposure to the air until brittle (*Comp.* 1894), so that they will rub to a paste which is not too moist and with which the Sugar and Gum, previously mixed, can be incorporated to form a moderately coarse powder.

Dose.—60 to 120 grains = 4 to 8 grammes.

AMYL NITRIS.

AMYL NITRITE.

Fr., Azotité d'Amyle; Ger., Amylnitrit; Ital., Nitrito d'Amile; Span., Nitrito de Amilo.

A pale yellow, volatile liquid, with a characteristic ethereal odour and pungent aromatic taste. It consists principally of Iso-Amyl Nitrite, $C_5H_{11}NO_2$, eq. 116·25; which is present in variable quantity, together with other Nitrites. It may be produced by the action of Nitrous Acid upon that fraction of the higher Alcohols distilling between 127·7° and 132·2° C. (262° and 272° F.). Should be stored in well-stoppered glass bottles of an amber colour, or preferably in glass capsules of a dark amber tint.

Solubility.—Insoluble in Water. Soluble in Alcohol (90 p.c.), Ether and Chloroform.

Medicinal Properties. — Antispasmodic. Very useful in angina pectoris, aneurismal pain, hæmoptysis, dyspnœa of bronchitis and spasmodic asthma; has been used with advantage in epilepsy, in trifacial neuralgia, in migraine and sea-sickness, and hemicrania, if these conditions be accompanied by facial pallor; also in laryngeal spasm, in hepatic, intestinal and renal colic, in spasmodic forms of dysmenorrhœa and in eclampsia; a restorative in cardiac failure from Chloroform or Nitrous Oxide anæsthesia or other cause; has been found useful as an antidote to Strychnine.

In angina, where a rapid fall of arterial tension is required, the

B.P. Amyl Nitrite, which contains Iso-butyl Nitrite, is best, but in other cases, such as Bright's disease, when the prolonged action is required, pure Amyl Nitrite is more effective. As some persons are peculiarly susceptible to its action, its use demands caution.

A description of 77 cases of pneumonia treated by the inhalation of large doses.—*B.M.J.E.* '95, ii. 96; *T.G.* '96, 49.

Promptly effective and safer than Morphine in hæmoptysis, and can be used at earliest possible moment by patient himself.—*L.* '08, i. 565.

The most efficient and expeditious remedy in hæmoptysis.—*Pr.* '07, i. 679; *T.G.* '07, 323; *L.* '06, ii. 1685; '07, i. 939; '08, i. 427, 504.

Successful in postpartum hæmorrhage (*B.M.J.* '06, ii. 1125); and in menorrhagia.—*L.* '08, ii. 418.

Inhalations have been recommended (*L.* '05, i. 800) in deep-seated hemorrhage. It has also been used with success in tuberculous hæmoptysis.

Dose.—For inhalation, the vapour of 2 to 5 minims = 0·12 to 0·3 c.c.

Prescribing Notes.—*It can be obtained in small* **glass capsules** *covered with cotton wool and silk, each containing from* 2 *to* 5 *minims. The covered capsule is placed in a handkerchief, then carefully broken across, and the escaping vapour immediately inhaled.*

In mixtures to be swallowed, dose, ½ *to* 1 *minim dissolved in Alcohol* (90 *p.c.*) *and diffused through Water by means of Tragacanth* (*in powder*) 2 *grains to the fl. oz.; to be used with caution.*

Should be handled carefully, as even smelling it causes violent flushings.

Not Official.—Iso-butyl Nitrite, Tertiary Amyl Nitrite, Amyl Valerianate and Mistura Amyl Nitritis.

Foreign Pharmacopœias.—Official in Austr., Dutch, Ger., Jap., Russ. and Swed., sp. gr. 0·870 to 0·880, boils at 97° to 99° C.; Belg., sp. gr. 0·870 to 0·900, boils at 99° C.; Fr., sp. gr. 0·88, boils at 96° to 99° C.; Mex. (Eter Amilnitroso), sp. gr. 0·877, boils at 95° C.; Ger., Russ. and Swed., boils at 97° to 99° C.; Hung., sp. gr. 0·900, boils at 96° to 99° C.; Ital. (Nitrito d'Amile), sp. gr. 0·87 to 0·89, boils at 97° to 99° C.; Swiss, sp. gr. 0·870 to 0·900, boils at 97° to 99° C.; U.S., sp. gr. 0·865 to 0·875 at 25° C. (77° F.).

Tests.—The distinguishing tests for Amy Nitrite are its odour; the peculiar flushing of the face and strange sensation of fulness in the head produced by its inhalation, the specific gravity which should be from 0·870 to 0·880, the temperature [90° to 100° C. (194° to 212° F.)] at which the greater portion of the liquid passes over when distilled with the bulb of the thermometer not dipping below the surface of the residual liquid; the production of Potassium Iso-valerianate when it is dropped gradually on to fused Potassium Hydroxide. The *B.P.* and the *P.G.* give the specific gravity as 0·870 to 0·880; the *U.S.P.* gives 0·865 to 0·875 at 25° C. (77° F.). The *B.P.* requires that 70 p.c. should pass over between the temperatures indicated above; the *P.G.* states that it boils at 97° to 99° C. (206·6° to 210·2° F.); the *U.S.P.* has deleted the boiling point. The *B.P.* requires that only a pale yellow colour shall be produced in the aqueous liquid when the Nitrite is shaken with an equal volume of Potassium Hydroxide Solution; the *U.S.P.* and *P.G.* require that Silver Nitrate Solution should not turn brown or black. The *U.S.P.* and the *P.G.* both adopt a test for the limit of acidity, which is given below under that heading. The *B.P.* requires it to yield not less than 6 times its volume of Nitric Oxide gas; the *U.S.P.* requires it to contain about 80 p.c. of Amyl Nitrite, chiefly Iso-amyl Nitrite, as determined gasometrically by the process given below under the heading of Gasometric Determination. When a measured quantity of 5 c.c. of a 5 p.c. solution of the Nitrite in Alcohol (90 p.c.) is intermittently shaken for 5 minutes in a nitrometer containing saturated brine solution, with 5 c.c. of strong Potassium Iodide Solution and 5 c.c. of Diluted Sulphuric Acid, and the level of the liquid in the two limbs of the nitrometer adjusted to the same level, it should yield a volume of gas not less than 30 c.c., adjusted to the normal temperature and pressure. The number of c.c. of gas evolved multiplied by 5 (4·98) gives the weight in milligrammes of Amyl Nitrite in the quantity operated upon. The operation may be conducted in two parts, the Potassium Iodide Solution being first run into the nitrometer, followed by the Diluted Sulphuric Acid. The measure of the gas first liberated affords a criterion of the acidity of the sample. The *U.S.P.* neutralises any acidity by first treating the Amyl Nitrite with Potassium Bicarbonate and weighs the Nitrite instead of measuring it. The temperature at which the readings are taken is 25° C. (77° F.) and a correction is made for each degree above or below. A correction is also made for the barometric pressure above or below 760 mm. of Mercury.

The more generally occurring impurities are Water and Aldehyde. All three Pharmacopœias adopt the method of cooling the specimen to the temperature of melting ice, in testing for Water; if water be absent it will remain clear. Aldehyde in the *B.P.* is examined for by Potassium Hydroxide Solution, no quantities being given; in the *U.S.P.* and *P.G.* by Silver Nitrate Solution rendered slightly ammoniacal by the addition of a few drops of Ammonia Solution, both Pharmacopœias carefully stating the quantities to be employed in the test, the *U.S.P.* uses Alcohol (94·9 p.c.) for diluting, the *P.G.* Absolute Alcohol.

Acidity.—5 c.c. Amyl Nitrite should not overcome the alkaline reaction of 0·1 c.c. Solution of Ammonia with 1 c.c. of Water, *P.G.* If 5 c.c. be agitated with a mixture of 1 c.c. Normal Potassium Hydroxide Solution and 10 c.c. of Water with a drop of Phenolphthalein T.S., the red tint of the aqueous layer should still be perceptible, *U.S.P.*

Silver Nitrate Solution.—1 c.c. Amyl Nitrite should not turn brown or black a mixture of 1·5 c.c. Silver Nitrate Solution, 1·5 c.c. Alcohol and a few drops of Solution of Ammonia on gently warming (test for Aldehyde), *P.G.* and *U.S.P.* The *P.G.* uses Absolute Alcohol in the place of Alcohol.

Gasometric Determination.—Transfer about 3 c.c. of Amyl Nitrite, which has been previously shaken with 0·5 gramme of Potassium Bicarbonate and carefully decanted, to a tared 100 c.c. measuring flask, and weigh it accurately. Add sufficient Alcohol (94·9 p.c.) to bring the volume to exactly 100 c.c. and mix thoroughly. Introduce into a nitrometer exactly 10 c.c. of the alcoholic solution, followed by 10 c.c. of Potassium Iodide T.S., and afterwards by 10 c.c. of Volumetric Sulphuric Acid Solution. When the volume of gas has become constant (within 30 to 60 minutes), note the volume of gas collected. Multiply this volume in c.c. by 4·8, and divide the product by the original weight of the Amyl Nitrite, the quotient will represent the percentage of Amyl Nitrite in the liquid at standard temperature and pressure. Correction for temperature and pressure: The temperature correction is one-third of one per cent. of the total percentage just found for each degree, additive if the temperature is below, and subtractive if it is above 25° C. (77° F.). The barometric correction is fourthirtieths of 1 p.c. for each mm., additive if it is above, and subtractive if it is below 760, *U.S.P.*

For comments *see* above in large type.

Not Official.

MISTURA AMYL NITRITIS.—Amyl Nitrite, 2; Alcohol (90 p.c.), 16; mix and add to Powdered Tragacanth, 1, contained in a dry phial; then add gradually Distilled Water to 240; shake well. **Dose.**—1 or 2 drm. (3·5 to 7 c.c.). —*Martindale.*

Amyl Nitrite, 1½ minims; Alcohol, 12 minims; Tragacanth, 1 grain; Syrup, 30 minims; Distilled Water, to 4 fl. drm.—*B.P.C.*

ISO-BUTYL NITRITE.—Its action and uses are similar to those of Amyl Nitrite.

TERTIARY AMYL NITRITE (Bertoni's Ether).—Prepared from tertiary Amylic Alcohol (Amylene Hydrate). It possesses all the properties of the official Nitrite, but it can be taken in larger quantities without danger, and it does not cause flushing of the face.

The tertiary Nitrites have a more powerful influence generally than the secondary or primary.

Dose.—5 drops on sugar, or in capsules.

AMYL VALERIANAS.—A colourless liquid, possessing a strong fruity odour. Sedative and antispasmodic.

Dose.—2 to 3 minims = 0·13 to 0·2 c.c. in capsules.

Not Official.

AMYLENE HYDRATE.

TERTIARY AMYLIC ALCOHOL. DIMETHYL-ETHYL CARBINOL.

$C_5H_{12}O$, eq. 87·43.

A clear, colourless, oily liquid, with a strong characteristic odour and taste.

Solubility.—1 in 8 (or rather less) of Water; in all proportions of Alcohol (90 p.c.).

Medicinal Properties.—Hypnotic. Has no unpleasant after-effects, and its taste is less objectionable than that of Paraldehyde. Successful in mania (especially morphinomania, *M.A.* '94, 426), delirium tremens, and in severe forms of epilepsy where bromides are found useless.

Recommended where hypnotics are required for a long period.—*Y.B.T.* '94, 74.

1½ grammes Amylene Hydrate repeated in two hours gave six hours' uninterrupted sleep in a case recovering from the morphia habit.—*L.* '01, ii. 366.

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

Prescribing Notes.—*Dissolved in Water or Alcohol* (90 *p.c.*); *also given in* **capsules**; *sometimes given as an enema.*

Cannot be employed subcutaneously owing to pain produced.—B.M.J.E. '94, ii. 64.

Foreign Pharmacopœias.—Official in Dan., Ger., Norw. and Swiss (Amylenum Hydratum). Not in the others.

Tests.—It should possess a specific gravity of 0·812 to 0·820 and a boiling point of 99° C. (210·2° F.) to 103° C. (217·4° F.). 1 c.c. dissolved in 20 c.c. of water should not within 10 minutes either decolorise 2 drops of a 1 in 1000 Potassium Permanganate Solution, indicating the absence of Ethyl or Amyl Alcohol; or blacken Silver Nitrate Solution at 100° C. (212° F.), indicating the absence of Aldehyde.

AMYLUM.

STARCH.

Fr., Amidon de Blé; Ger., Weizenstärke; Ital., Amido; Span., Almidon.

A white, odourless, tasteless, impalpable powder, or irregular, angular or columnar masses; procured from the Fruits or grains of wheat, *Triticum sativum*, Lam.; maize, *Zea Mays*, L., and rice, *Oryza sativa*, L.

Medicinal Properties.—Protective, absorbent. A good application to the skin when irritable or inflamed, or in trivial burns. It has been given in powder for diarrhœa; and is a very good antidote for Iodine poisoning, followed by an emetic. Mucilage of Starch, 1 in 40, is useful as a basis for enemas. In the form of Violet Powder it is useful to prevent the chafing and excoriation of the skin of infants. **Glycerin** of Starch is a good application for chilblains and chapped hands, and as a protective in certain skin diseases.

Official Preparations.—Glycerinum Amyli. Used in the preparation of Pulvis Tragacanthæ Compositus.

Not Official.—Mucilage of Starch, Test Solution of Starch and Pulvis Violæ.

Foreign Pharmacopœias.—Official in Austr., Wheat and Rice; Belg., Arrowroot, Maize, Potato, Rice and Wheat; Fr., Ger., Hung., Ital., Mex., Norw., Port., Russ., Span. and Swed.; all Wheat Starch. Dan., Arrowroot and Wheat; Dutch, Arrowroot, Potato, Rice and Wheat; Jap., Katakuri, Kuzu and Potato; Port. allows several other Starches; Swiss, Rice and Wheat Starch; U.S., Maize Starch. Fr. has also Potato Starch.

Descriptive Notes.—Starch is met with in commerce in irregular columnar or pseudocrystalline masses, which may be white or coloured slightly blue, or in powder. The starches most commonly used for food are those of Maize, Rice and Potato, although a number of others are met with, descriptions of which with measurements and excellent illustrations are given in Greenish's *Anatomical Atlas*, pl. i.–ix., pp. 6–22, and in Tschirch and Oesterle's *Anatomische Atlas* (1900).

The official Starch includes those of Wheat, Maize and Rice, and may be either in the columnar form or in powder, but should be white and inodorous. Wheat Starch is described as consisting of large and small granules, the larger being lens-shaped and faintly striated concentrically, with a nearly central hilum; Maize Starch as frequently polygonal, more uniform in size, and somewhat smaller than the large granules of Wheat Starch, with a distinct hilum but no striæ; and Rice Starch as consisting of extremely minute granules nearly uniform in size, polygonal, and without evident hilum or striæ. Potato Starch, by reason of its cheapness, is employed for many technical purposes and may be expected to occur as an adulteration of other Starches. It should be noted that the lenticular grains of Wheat Starch when seen edgewise under the microscope appear elliptical or almost linear, and might be mistaken for the flattened grains of zingiberaceous Starches; that a hilum is rarely evident.

Arrowroot, obtained from *Maranta arundinacea*, was formerly official; like all other Starches it is apt to absorb the odour and flavour of any drugs or perfumes near which it is placed and should consequently be kept in jars or tins.

The commercial Starches may to some extent be distinguished by the different tints assumed by them when placed under a bell glass around a crystal of Iodine, and differ also in the character of the jelly they form with the same proportion of Water or Glycerin. In the *P.G.* only the Starch of Wheat is official, the measurements of the grains are given as 0·015 to 0·045 mm. broad, and 0·002 to 0·008 mm. in diameter. In the *U.S.P.* Maize Starch is alone official and the diameter of the grain is given as 0·010 to 0·025 mm.

Tests.—The distinguishing tests for Starch are the production of a translucent colourless gelatinous solution when boiled with water; the production of a deep blue colour when Iodine Solution is added to this solution when cold; the ready hydrolysis with the formation of products having a strong reducing action upon Fehling's Solution (Potassio-cupric Tartrate Solution) when the gelatinised solution is treated at a temperature of 100° F. (37·7° C.), with an active solution of an amylolytic enzyme.

The more generally occurring impurities are free alkali and an excessive amount of mineral matter. The *B.P.* includes as the official Starches, Wheat, Rice and Maize; the *U.S.P.*, Maize Starch; the *P.G.*, Wheat Starch only. Both *B.P.* and *U.S.P.* requires that when triturated with cold Water it shall yield a mixture having neither an acid nor an alkaline reaction to test papers; the *P.G.* stipulates that 1 part by weight of Starch boiled with 50 parts by weight of Water shall yield a mucilage which does not alter Litmus paper. Neutral Starch is, however, seldom obtained; it is, as a rule, faintly alkaline.

The *B.P.* makes no reference to the amount of ash permissible; the *U.S.P.* and *P.G.* state that not more than 1 p.c. of residue shall remain after complete incineration.

The *U.S.P.* requires that when freed from Water by careful drying in a current of warm air, Starch should show not less than 95 p.c. of hydrolysable carbohydrates.

Preparation.

GLYCERINUM AMYLI. Glycerin of Starch.

Starch, 1; Glycerin, 6½; Distilled Water, 1½; stir them together whilst sufficient heat is applied to burst the Starch granules, and form a homogeneous mass.

The operation should be conducted as quickly as possible, to avoid excessive loss of Water; and to prevent carbonisation from overheating, the use of an oil-bath is recommended.

This formula has been altered in each successive edition of *B.P.* In 1867 the formula was Starch 1, Glycerin 8; in 1885, Starch 1, Glycerin 5, Distilled Water 3; and the proportions are now as that given above.

Foreign Pharmacopœias.—Official in Belg., Starch 10, Water 15, Glycerin 90; Fr. (Glycéré d'Amidon), Starch 1, Water 1, Glycerin 13; Ital. (Glycerolato d'Amido), Starch 7, Water 3, Glycerin 90; Mex. (Glycerado de Almidon), Starch 2·4, Glycerin 30; Port. (Glycerado Commum), Starch 1, Water 2, Glycerin 17; Span. (Glicerolado de Almidon), Starch 1, Water 2, Glycerin 8; U.S. (Glyceritum Amyli), Starch 1, Water 1, Glycerin 8. The following are called Unguentum Glycerini; Austr., Starch 1, Water 2, Glycerin 10; Dan., Starch 3, Water 3, Glycerin 14; Ger. and Jap., Starch 10, Water 15, Glycerin 90; Hung., Tragacanth 1, Alcohol 5, Glycerin 50 (no Starch); Norw. and Swed., Starch 1, Glycerin 15⅔; Russ., Starch 1, Water 1, Glycerin 14; Swiss, Starch 7, Water 7, Glycerin 93. All by weight.

Not Official.

MUCILAGE OF STARCH.—A recently prepared solution containing approximately 2 p.c. w/v of Starch prepared by first rubbing 1 gramme of Starch to a smooth paste with Water, and adding a further sufficient quantity of Water to produce 50 c.c., after boiling for a few minutes the mixture is cooled.

PULVIS VIOLÆ.—Orris Rhizome, in fine powder, 12 lb.; Oil of Bergamot, 1 fl. oz.; Otto of Rose, 144 minims; Tincture of Musk (Squire), 3½ fl. oz.; Starch, in powder, 112 lb.—*Squire.*

Orris Rhizome, in fine powder, 12·50; Oil of Bergamot, 0·25; Oil of Neroli, 0·02; Starch, in powder, *q.s.* to produce 100.—*B.P.C.*

TEST SOLUTION OF STARCH.—*See* Appendix.

Not Official.

AMYLUM IODATUM.

Iodine, 5; Starch, 95; Distilled Water, *q.s.* Triturate the Iodine with a little Distilled Water, add the Starch gradually, and continue triturating until the compound assumes a uniform blue colour approaching black. Dry at a temperature not exceeding 40° C. (104° F.) and rub it to a fine powder.

This has been incorporated in the *B.P.C.*

A teaspoonful thrice daily for lupus erythematosus.—*B.M.J.* '80, i. 652.

Not Official.

ANALGEN.

BENZANALGEN; QUINALGEN, ORTHOÆTHOXY-ANA-MONOBENZOYLAMIDOCHINOLIN.

A white crystalline powder, inodorous and tasteless.

This is similar in chemical composition and properties to Phenacetin, but with the Phenol ring replaced by the Quinoline ring.

Solubility.—Insoluble in Water; sparingly soluble in cold, more so in hot Alcohol; fairly soluble in Chloroform; almost insoluble in Ether.

Medicinal Properties.—Has been recommended in neuralgia, hemicrania, and bronchitic asthma, but it is not without unpleasant effects; the urine is frequently coloured red; toxic action and dangers.—*B.M.J.* '98, ii. 1055.

It has given relief in sciatica.—*M.A.* '94, 9; *B.M.J.E.* '93, ii. 87; *M.P.* '94, 621; *L.* '97, i. 1227.

Dose.—7½ to 15 grains = 0·5 to 1 gramme.

Prescribing Notes.—*Usually given in* **cachets,** *or Compressed Tablets.*

Tests.—Analgen melts at a temperature of 208° C. (406·4° F.), and should leave no residue on ignition. The cold saturated aqueous solution should yield a yellow coloration with Ferric Chloride Test-solution. It dissolves in cold concentrated Sulphuric Acid, forming a bright yellow coloured liquid, and on dilution with Water a lemon yellow coloured precipitate is thrown down. The cold saturated aqueous solution reduces Silver Nitrate Solution in the cold or on warming.

ANETHI FRUCTUS.

DILL FRUIT.

FR., ANETH; GER., DILLSAMEN; ITAL., ANETO; SPAN., ENELDO.

The dried ripe Fruit of the *Peucedanum graveolens*, Benth. and Hook. f.

Cultivated in Britain or imported from Central and Southern Europe.

Descriptive Notes.—Two varieties of Dill are met with in commerce, viz., the European and the Indian. The former only is official. The fruits are oval, flat, about $\frac{1}{6}$ inch (4 mm.) long, $\frac{1}{8}$ inch (2 to 3 mm.) broad, brown, with the two outer ridges developed into a paler marginal wing. A transverse section shows 6 vittæ. The odour and taste are aromatic.

The Indian Dill is narrower, more elliptical, more convex, and of a greyish tint, and is usually not so free from fruit-stalks as the European drug. The oil obtained from it differs in containing Dill Apiol, and less Carvone, as well as in chemical and physical characters, from that of European Dill. The plant yielding it is *Peucedanum Sowa*, Benth. and Hook. f., considered by some botanists as only a variety of *P. graveolens*, but the *B.P.* description excludes the use of the Indian drug. The Dill Apiol separates during distillation, forming a layer at the bottom of the receiver.

Medicinal Properties.—Stomachic and carminative; chiefly given to children in cases of flatulency; sometimes given with Sodium Bicarbonate, the taste of which it covers well.

Official Preparations.—Aqua Anethi and Oleum Anethi.

Foreign Pharmacopœias.—Official in Mex. (Eneldo), Port. (Endro). Not in the others.

AQUA ANETHI. DILL WATER.

Dill Fruit, 1; Water, 20; distil, 10. (1 in 10)

Not in the other Pharmacopœias.

Dose.—$\frac{1}{2}$ to 1 fl. oz. = 14·2 to 28·4 c.c.; for children, 60 minims = 3·6 c.c.

OLEUM ANETHI. OIL OF DILL.

A pale yellow, thin, oily liquid having a characteristic odour resembling Caraway, and possessing at first a sweetish and aromatic and subsequently a sharp, burning taste.

The Oil distilled from Dill Fruit.

Yield, 3 to 4 p.c.

It darkens in colour on exposure to air and light and should be preserved in well-stoppered bottles of a dark amber tint. It contains about 40 to 60 p.c. of Carvone, and a terpene Limonene, but no Anethol.

Solubility.—Readily soluble in Alcohol and Ether.

Dose.—$\frac{1}{2}$ to 3 minims = 0·03 to 0·18 c.c.

Not in the other Pharmacopœias.

Tests.—The distinguishing tests for Dill Oil are the strong characteristic odour, the specific gravity, which should be 0·905 to 0·920, the optical rotation, which should be from + 70° to + 80°, in a tube of 100 mm. length. It should yield a clear solution in from 6 to 8 parts of Alcohol (80 p.c.). Not less than 15 p.c. should distil below 185° C. (365° F.), and not less than 40 p.c. above 220° C. (428° F.). The abstraction of Carvone from the oil is indicated by a decrease in the specific gravity, and a diminution in the amount distilling above 220° C. (428° F.).

Not Official.

ANILINE.

C_6H_7N, eq. 92·40.

An oily liquid, colourless when freshly distilled, but very prone to become yellow or brown on exposure to air.

It should be kept in well-stoppered bottles of a dark amber tint and protected as far as possible from the air.

Solubility.—1 in 27 of Water; 5 in 4 of Alcohol (60 p.c.); mixes in all proportions with Alcohol (90 p.c.), Ether and Glycerin.

As a vehicle for dissolving Cocaine, for the production of local anæsthesia of the ear, 10 to 15 minims of a 5 p.c. solution of Cocaine made by dissolving Cocaine Hydrochloride 5 in dilute Alcohol 50, Aniline Oil 50.—*L.* '00, i. 1125; '01, i. 698.

Dose.—Not more than 7 minims = 0·5 c.c.—*L.* '00, i. 1127.

Several cases of poisoning from boots to which a black material containing an Aniline dye had recently been applied.—*L.* '02, i. 463.

Tests.—It should possess a specific gravity of 1·020 to 1·026, and a boiling point of 183° to 184° C. (361·4° to 363·2° F.). An aqueous solution of Aniline treated with a solution of Chlorinated Lime yields a dirty violet blue coloration changing to Indigo blue on the addition of Ammonia Solution. A few drops of Aniline warmed with an alcoholic solution of Potassium or Sodium Hydroxide and a drop or two of Chloroform evolve the characteristic, disagreeable, poisonous odour of Phenyl-Isonitrile.

ANISI FRUCTUS.

ANISE FRUIT.

Fr., Anis Vert; Ger., Anissame; Ital., Anice; Span., Anis.

The dried ripe Fruit of *Pimpinella Anisum,* L.

Medicinal Properties.—Stomachic and aromatic, carminative, slightly expectorant; used to relieve flatulence, and to diminish the griping of purgative medicines.

Official Preparations.—Aqua Anisi and Oleum Anisi.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex. (Anis Comun), Norw., Port., Russ., Span., Swed., Swiss and U.S.

Descriptive Notes.—Anise fruit occurs in commerce in several varieties, differing considerably in size and colour, and in degree of freedom from impurity. It possesses an aromatic and characteristic odour, and has a sweet taste. The official drug is limited to such varieties as are about $\frac{1}{5}$ inch (5 mm.) long, and $\frac{1}{12}$ inch (2 mm.) broad, and therefore includes the Maltese, Alicante and German varieties. Anise fruit is greyish-brown, *B.P.* (also greyish or greenish-grey, *U.S.P.*); ovate, stalked, with the two carpels united, and rough with minute 1-celled hairs; a transverse section exhibits numerous vittæ. The German variety is brownish and that of Alicante greenish; South Russian Anise is similar in size to Conium fruit. Conium has sometimes occurred mixed with Anise fruit in Italy. Its presence may be detected by the mouse-like odour developed when rubbed with a few drops of Liquor Potassæ. It differs from Anise in being without hairs, and having the ridges distinctly crenate, and the flat surface deeply grooved as seen in transverse section, and in being without vittæ in the mature fruit.

North Russian Anise is small and dark green or brownish, and it is used as a cheap source of the essential oil. The Syrian and Chilian varieties are usually very inferior and mixed with more or less foreign matter, and are consequently reserved for veterinary medicine. The varieties richest in essential oil are the Italian, Spanish and South Russian. The residue after distillation is valued as an ingredient for cattle foods. Under the microscope the distinguishing features are the simple, thick-walled, short, erect, straight or slightly curved hairs, with a minutely warty surface, and the striated surface of the flattened polygonal cells of the outer epidermis.

AQUA ANISI. Anise Water.

Anise Fruit, 1; Water, 20; distil, 10. (1 in 10)

Dose.—$\frac{1}{2}$ to 1 fl. oz. = 14·2 to 28·4 c.c.

Foreign Pharmacopœias.—Official in Belg., from the Spirit; Fr., Jap., Port. and Span., from Fruits; and U.S. from Oil. Not in the others.

OLEUM ANISI. Oil of Anise.

Fr., Essence d'Anis; Ger., Anethol; Ital., Essenza di Anice; Span., Esencia de Anis.

At temperatures above 15° C. (59° F.) it is a colourless or pale yellow refractive liquid, with a pleasant aromatic odour and very sweet taste; below 15° C. (59° F.) it becomes a white crystalline solid. It is obtained by distillation from the fruits of the official variety, or from the fruit of *Illicium Verum* or Star Anise.

It should be kept in amber-coloured well-stoppered glass bottles.

Solubility.—1 of Pimpinella Oil in 3 of Alcohol (90 p.c.); 1 of Illicium Oil in 4 of Alcohol (90 p.c.); a slight rise in temperature greatly increases the solubility in Alcohol (90 p.c.); both oils dissolve in all proportions of Absolute Alcohol; 1 of Pimpinella Oil in 200 of Alcohol (60 p.c.), at which point the Illicium Oil is distinctly turbid.

These variations in solubility seem to arise from the presence in the Illicium Oil of a small proportion of a much less soluble Oil, which is absent in the Pimpinella.

Dose.—$\frac{1}{2}$ to 3 minims = 0·03 to 0·18 c.c.

Prescribing Notes.—*May be taken on Sugar. Before dispensing an oil which has become partly solidified, it should be completely liquefied by warming, and well mixed by shaking.*

Official Preparation.—Spiritus Anisi. Contained in Tinctura Camphoræ Comp. and Tinctura Opii Ammoniata.

Not Official.—Aniseed Cordial, Elixir Anisi, Essentia Anisi, Tinctura Anisi, Anisic Acid, Sodium Anisate and Anethol.

Foreign Pharmacopœias.—The following are from **Pimpinella**: Dan., Dutch, Fr., Ital., Norw. and Russ., sp. gr. 0·980 to 0·990; Hung., sp. gr. 0·978 to 0·984; Port., sp. gr. 0·977 to 0·983; Mex., sp. gr. 0·982; Span., sp. gr. 0·984 to 0·986; Swiss, sp. gr. 0·984 to 0·994; U.S., sp. gr. 0·975 to 0·985 at 25° C. (77° F.). The following permit the use of both kinds: Mex., Port. and U.S. *See* also Anethol.

Tests.—The distinguishing tests for Anise Oil are its distinctive odour; its sweet taste; the specific gravity, which at 20° C. (68° F.) should be from 0·980 to 0·990; its optical rotation, which should be −1° to −2° in a tube of 100 mm. length; the melting point, which should not be below 15° C. (59° F.); the solidifying point, which should not be below 15° C. (59° F.).

The *B.P.* gives the sp. gr. at 20° C. (68° F.) as 0·975 to 0·990; the *P.G.* at 25° C. (77° F.) as 0·984 to 0·986; the *U.S.P.* at 25° C. (77° F.) as 0·975 to 0·988. The melting point given in the *B.P.* is from 10° to 15° C. (50° to 59° F.); the *U.S.P.* states that it should not be below 15° C. (59° F.) and gives the method outlined below for its determination.

80 to 90 p.c. of the oil should distil between 225° and 235° C. (437° to 455° F.), indicating a due percentage of Anethol. Neither *B.P.* nor *U.S.P.* make any reference to either the boiling point or to fractionation.

The Pimpinella Oil is readily distinguished from that of Star Anise by giving a deep blue colour on the addition of saturated solution of Hydrochloric Acid gas in Alcohol, but Schimmel and Co. state that the two varieties can only be distinguished by the odour and taste, and that the reaction with alcoholic Hydrochloric Acid does not give reliable results. The balance of opinion seems to be that it does afford a means of distinction.

The more generally occurring sophistications are Fennel Oil, or its stearoptene; volatile oils containing Phenols; Alcohol; the fluid portion remaining after the extraction of the Anethol; and Petroleum. Fennel Oil or its stearoptene are detected by the optical rotation of the sample, both these adulterants being dextrogyrate; volatile oils containing Phenols are detected by a blue or brownish colour produced by the addition of Ferric Chloride Test-solution to an alcoholic solution of the oil; Alcohol by the decrease in volume when the oil is shaken in a graduated measure with Water; the fluid portion remaining after the extraction of Anethol, by the alteration in the melting and solidifying point; and Petroleum by the Alcohol solubility—the pure oil dissolves 1 in 3 of Alcohol (90 p.c.); an oil containing 5 p.c. of Petroleum will not dissolve 1 in 10. The oil undergoes oxidation by exposure to air, and its characters are greatly changed. Rise of specific gravity and lowering of the melting point are the principal indications as to the extent of oxidation.

Melting Point.—In the *U.S.P.* the following method is given to determine the congealing point, which should not be below 15° C. (59° F.). Transfer about 10 c.c. of the Oil to a test-tube placed in Water cooled with Ice; insert a thermometer at once into the Oil and allow it to remain undisturbed until its temperature has fallen to about 6° C. (42·8° F.). Induce crystallisation either by rubbing the inner wall of the test-tube with the thermometer or by the addition of a particle of Solid Anethol, remove the test-tube from the bath, and stir constantly during the solidification of the Oil. The highest temperature reached during the crystallisation is regarded as the congealing point.

Preparation.

SPIRITUS ANISI. SPIRIT OF ANISE.

Oil of Anise, 1; Alcohol (90 p.c.), *q.s.* to make 10. (1 in 10)

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

Half the strength of *B.P.* '85.

Foreign Pharmacopœias.—Belg., 1 Oil in 100; Fr., 1 Oil in 50; U.S., Spiritus, 1 Oil in 10; Austr., 1 of Fruits in 4; Span. has Alcohol de Anis Amoniacal, Oil 1, Liquid Ammonia 5, Alcohol (95 p.c.) 24. All by weight, except U.S. Not in the others.

Not Official.

ELIXIR ANISI. *Syn.* ANISEED CORDIAL.—Anethol, 3·5; Oil of Fennel, 0·5; Spirit of Bitter Almond (*U.S.P.*), 12; Alcohol (95 p.c.), 240; Syrup (*U.S.P.*), 625; Water, 125; Purified Talc (*U.S.P.*), 15. Average Dose for infants, 1 c.c. (15 minims).—*U.S.N.F.*

Anethol, 0·35; Oil of Fennel, 0·05; Spirit of Bitter Almond, 1·25; Alcohol (90 p.c.), 24; Syrup, 62·50; Magnesium Carbonate, 1·50; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

ESSENTIA ANISI.—Oil of Anise, 1; Rectified Spirit, 4.—*B.P.* 1885. This has been incorporated in the *B.P.C.*

TINCTURA ANISI—(*Ital.*, *Mex.* and *Russ.*).—Anise Fruit, 1; Alcohol, 5.

ANISIC ACID ($H.C_8H_7O_3$).—It occurs in colourless, shining acicular crystals obtained by the oxidation of Oil of Anise or Anethol.

Solubility.—Almost insoluble in cold Water; 1 in 700 boiling Water; 1 in 36 of Alcohol (90 p.c.); 1 in 50 of Ether.

SODIUM ANISATE.—In rhombic crystals, or a crystalline powder, frequently efflorescent, with a slight aromatic odour.

Solubility.—1 in 5 of Water; 1 in 24 of Alcohol (90 p.c.).

Anisic Acid and its Sodium salt have been stated to possess antiseptic and antipyretic properties, similar to Salicylic Acid.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

ANETHOL ($C_{10}H_{12}O$).—The Stearoptene separated from either of the Anise Oils. It is said to have a finer flavour than the Oil, being free from the acridity pertaining to the non-freezing portion of the Oil. A white crystalline mass possessing a strong characteristic Anise-like odour and sweetish taste. When melted it forms a highly refractive, almost colourless, liquid.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Ger., Jap. and Swed. Not in the others.

Tests.—It has at 25° C. (77° F.) a sp. gr. of 0·984 to 0·986; a melting point of 22·5° to 23° C. (72·5° to 73·4° F.); and a boiling point of 232° to 234° C. (449·6° to 453·2° F.). It should form a clear solution in 3 parts of Alcohol (90 p.c.).

ANTHEMIDIS FLORES.

CHAMOMILE FLOWERS.

Fr., Camomille Romaine; Ger., Romische Kamille; Ital., Camomilla Romana; Span., Manzanilla Romana.

The dried expanded Flower-heads of the common or Roman Chamomile, *Anthemis nobilis*, L., collected from cultivated plants.

Medicinal Properties.—Stomachic, tonic and carminative. In large doses, emetic. Useful in atonic dyspepsia; externally it is employed as a fomentation for bruises and contusions.

Prescribing Notes.—*The Extract or Oil is frequently added to Rhubarb and aperient medicines as a corrective. A little Soap added in the case of the Oil, makes a good pill-mass.*

Official Preparations.—Extractum Anthemidis, and Oleum Anthemidis. The **Oil** is contained in the Extract.

Not Official.—Aqua Anthemidis, Decoctum Anthemidis et Papaveris, Oleum Chamomillæ Infusum, Infusum Anthemidis, Infusum Anthemidis Concentratum, Liquor Anthemidis et Papaveris, and Tinctura Anthemidis.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Fr., Ital., Jap., Mex., Port., Span., Swiss and U.S. Not in the others. Also Matricaria in Austr., Dan., Dutch, Ger., Hung., Ital., Jap., Mex., Norw., Russ., Span. (Manzanilla ordinaria), Swed. and Swiss.

Descriptive Notes.—The drug is met with in commerce chiefly in two forms, known respectively as English and exotic. The official description as well as that of the *U.S.P.* applies to the former. The flower-heads are hemispherical, 10 to 20 mm. ($\frac{4}{10}$ to $\frac{8}{10}$ inch) in diameter, and nearly white in colour. The florets are ligulate, suddenly tapering in the lower half and about 1 cm. ($\frac{4}{10}$ inch) long, a few tubular florets usually remaining in the centre. There is no pappus, and the solid conical receptacle is covered with narrow membranous bracts or paleæ, visible when the florets are removed. The involucral scales are also membranous and obtuse, with a green central nerve. The exotic Chamomile flowers, chiefly imported from Belgium and France, differ in being rather larger and in the florets being broader and all ligulate. In Scotland the single wild Chamomile flowers are often sold under the name of Scotch Chamomiles. These differ in having only one row of ligulate florets, all the centre consisting of yellow tubular florets. Scotch Chamomiles are sometimes preferred, on the supposition that the central contain more oil then the ligulate florets, but the single Chamomiles are excluded from use in dispensing by the *B.P.* description.

The Chamomile flowers (Flores Chamomillæ) official in the *P.G.* are the single flower-heads of *Matricaria Chamomilla*, L. These are much smaller than those of *Anthemis nobilis*, averaging only $\frac{1}{5}$ inch (5 mm.) in diameter, and have a portion of the fruit-stalk attached to them. The receptacle is nearly conical, but hollow, and has no paleæ. The odour resembles that of the *B.P.* Chamomile, but is weaker.

If Chamomile flowers have a brownish tint they have either been damaged by rain, or not carefully dried, or have become brownish by keeping. In either case they must be regarded as of inferior quality and unfit for dispensing purposes. The taste of Chamomile flowers is bitter and the flavour strongly aromatic.

The double flowers of *Chrysanthemum Parthenium*, Bernh., which have occasionally been found mixed with Chamomile flowers have a slightly convex, not conical, solid receptacle, and the few paleæ sometimes present are lanceolate and acute.

Preparations.

EXTRACTUM ANTHEMIDIS. EXTRACT OF CHAMOMILE.

An aqueous extract of the Flowers treated by decoction, to which Oil of Chamomile is added just before completion of the evaporation, in the proportion of 15 minims of Oil to each pound of the Flowers employed.

The double Flowers yield about 30 p.c. of Extract.

Dose.—2 to 8 grains = 0·13 to 0·52 gramme.

Foreign Pharmacopœias.—Official in Ital., from both; Dan. and Swed., from Matricaria; Mex. (Extracto de Manzanilla). Not in the others.

OLEUM ANTHEMIDIS. OIL OF CHAMOMILE.

A light blue oily liquid, of an aromatic characteristic odour and balmy taste; distilled from the dried Flowers of *Anthemis nobilis*. On exposure to light and air the Oil acquires a greenish or yellowish-brown colour, and should therefore be kept in well-stoppered glass bottles of a dark amber colour, and exposed as little as possible.

Solubility.—Sparingly in Water; 10 in 3 of Alcohol (90 p.c.).

Dose.—½ to 3 minims = 0·03 to 0·18 c.c.

Foreign Pharmacopœias.—Official in Belg., from Anthemis; Fr., from Anthemis; Ital. and Swiss, from Matricaria. Not in the others.

Tests.—Oil of Chamomile has a specific gravity of about 0·910. The optical rotation should be between + 1° and + 3° in a tube of 100 mm. length. The optical rotation is not given in the *B.P.*

Not Official.

AQUA ANTHEMIDIS.—Flowers 1, Water 20, distil 10. (1 in 10)

Foreign Pharmacopœias.—Official in Austr., 1 in 10; Belg., 3 of the Spirit in 100; Port., 1 in 4. Ital., Matricaria, 1 in 2; Anthemis, 1 in 2½. All distilled. Port, from Anthemis; Austr., from Matricaria; Ital., from both. Not in the others.

Oleum Chamomillæ Infusum.—Chamomile Flowers, 1; Olive Oil, 10; digest in a water-bath for 2 hours, strain, press and filter.

Foreign Pharmacopœias.—Official in Fr. and Port., 1 in 10; Span., 1 in 8; from Anthemis. Ital., 1 in 4; from Anthemis and from Matricaria. Belg. (Oleum Chamomillæ Camphoratum), 1 of Oil with 999 of Camphorated Oil. Span. (Aceite de Manzanilla Alcanforado), 1 of Camphor with 9 of Ol. Cham. Infus.

DECOCTUM ANTHEMIDIS ET PAPAVERIS.—Chamomile Flowers, 10; Poppy Capsules, bruised, 5; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

INFUSUM ANTHEMIDIS.—Chamomile Flowers, 1; Boiling Distilled Water, 20. Infuse 15 minutes and strain.—*B.P.* 1885.

This has been incorporated in the *B.P.C.*

INFUSUM ANTHEMIDIS CONCENTRATUM.—Chamomile Flowers, in powder, 40; Oil of Chamomile, 0·2; Alcohol (20 p.c.), *q.s.* to make 100; mix the Oil of Chamomile thoroughly with the powder and submit the latter to repercolation.

Dose.—As a stomachic, 1 to 4 fl. drm.; as an emetic, 5 to 10 fl. drm.—*Farr* and *Wright*, *P.J.* '06, i. 165 and '07, i. 621; *C.D.* '06, i. 252; *Y.B.P.* 1907, 249.

This appears in the *B.P.C.*

LIQUOR ANTHEMIDIS ET PAPAVERIS.—Concentrated Infusion of Chamomiles and Liquid Extract of Poppies, equal volumes. One or two teaspoonfuls in half a pint of boiling Water, for use as a fomentation.

TINCTURA ANTHEMIDIS.—Single Chamomiles, carefully dried, 1; sufficient Alcohol (90 p.c.) to percolate, 8; or an equivalent quantity of fresh Flowers (about 3), and macerate with 8 of Alcohol (90 p.c.) for 7 days, and press.

The moisture in the fresh flowers reduces the strength of the spirit so that less resin is dissolved, and the tincture is consequently less bitter.

Foreign Pharmacopœias.—Official in Austr., 1 in 5, from Matricaria; Ital. and Mex., 1 in 5, both varieties; Belg., Chamomillæ Spiritus, 1 of the Oil in 100.

ANTIMONII OXIDUM.

ANTIMONIOUS OXIDE.

Sb_4O_6, eq. 571·28.

A white, more or less crystalline, powder.

When a solution of Antimonious Chloride is poured into Water Antimony Oxychloride is precipitated, and this, when in turn decomposed with Sodium Carbonate, yields Antimonious Oxide.

Solubility.—Insoluble in Water, Alcohol, and Nitric Acid; readily dissolved by Hydrochloric Acid and warm solution of Tartaric Acid.

Medicinal Properties.—Similar to but less active than the Tartrate because less soluble.

Dose.—1 to 2 grains = 0·06 to 0·13 gramme.

Prescribing Notes.—*The Pulvis Antimonialis is generally given in the form of* **powders, pills** *or* **cachets.**

Official Preparation.—Pulvis Antimonialis. Used in the preparation of Antimonium Tartaratum.

Foreign Pharmacopœias.—Official in Mex. (Oxido Antimonioso Precipitado), Norw. (Oxydum Stibicum), Port. and Span. Not in the others.

Tests.—The distinguishing tests for Antimony Oxide are that its slightly acidified solution yields with Hydrogen Sulphide Solution an orange-coloured precipitate soluble in Potassium Hydroxide Solution and in Ammonium Hydrosulphide Solution, insoluble in Ammonium Carbonate Solution; a cold white porcelain vessel allowed to impinge upon the upper flame produced on igniting the gas yielded by the interaction of Zinc, Hydrochloric Acid and a solution of the Oxide, acquires a dark metallic-looking stain, which is unaffected by Calcium or Sodium Hypochlorite Solution; the production of a metallic-looking coating on Copper when a piece of Copper foil is boiled with a solution of the Oxide containing free Hydrochloric Acid; the formation of a white amorphous but no crystalline sublimate when this coating is volatilised in a tube; the formation of a black deposit of Antimony on the Platinum, when a Zinc rod is allowed to rest on a piece of Platinum foil in an acidified solution of the Oxide.

It is officially required to indicate 99·98 p.c. of pure Antimonious Oxide, as indicated by titration with Deci-normal Volumetric Iodine Solution. The Oxide is brought into solution by means of Acid Potassium Tartrate or Tartaric Acid and an alkaline reaction throughout the titration ensured by the addition of Sodium Bicarbonate, this being necessary to neutralise the Hydriodic Acid set free during the reaction, Hydriodic Acid otherwise acting as a reducing agent. A weighed quantity of 0·5 gramme dissolved in twice its weight of Acid Potassium Tartrate then mixed with 3 grammes of Sodium Bicarbonate and cooled should decolorise 70 c.c. of the Volumetric Solution of Iodine.

The more generally occurring impurities are Antimonic compounds, Arsenic, Calcium, Copper, Iron, Lead, Chlorides and Sulphates. It is officially required to dissolve completely in an excess of Acid Potassium Tartrate. The extent to which it is true depends upon the age of the specimen, Antimonious Oxide undergoes oxidation on exposure to air, the resulting Antimonic compounds being insoluble. The amount of residue therefore forms a criterion of the proportion of the latter. The remaining impurities are grouped together in the *B.P.* under the elastic expression, 'it should yield no characteristic reaction with the tests for,' etc. The solution obtained by dissolving the Oxide in Hydrochloric Acid should yield no reaction with the Bettendorf's test, indicating the absence of Arsenic. When dissolved in Sodium Hydroxide Solution (15 p.c. w/w) it should yield on the addition of Hydrogen Sulphide Solution no dark coloration, indicating the absence of Copper, Lead and Iron; a white precipitate would indicate the presence of Zinc. Another portion of the sample dissolved in Sodium Hydroxide Solution (15 p.c. w/w) when supersaturated with Nitric Acid should yield only a faint turbidity on the addition of either Silver Nitrate Solution or Barium Chloride Solution, indicating the absence of more than a trace of Chlorides and Sulphates.

Preparation.

PULVIS ANTIMONIALIS. Antimonial Powder.

Antimonious Oxide, 1; Calcium Phosphate, 2.

Dose.—3 to 6 grains = 0·2 to 0·4 gramme.

Foreign Pharmacopœias.—Official in Mex., Antimonious Oxide 1, Calcium Phosphate 2; Port., Antimonious Oxide 35, Calcium Phosphate 65. Not in the others.

ANTIMONIUM NIGRUM PURIFICATUM.

ANTIMONIOUS SULPHIDE.

Fr., Trisulfure d'Antimoine; Ger., Gereinigtes Schwefelantimon; Ital., Trisolfuro di Antimonio; Span., Solfuro de Antimonio Purificada.

A heavy, inodorous, greyish-black crystalline powder, consisting of native Antimonious Sulphide Sb_2S_3, eq. 333·46, separated from siliceous material and from arsenical compounds.

Official Preparation.—Used to prepare Antimonium Sulphuratum.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Fr., Ger., Hung., Ital. (Crudo and Depurato), Mex., Port., Span. (Sulfuro de Antimonio Purificada), Swed. and Swiss. Not in the others.

Tests.—Antimonious Sulphide yields the tests distinctive of Antimony given under Antimonious Oxide; it moreover evolves on boiling with Hydrochloric Acid the characteristic disagreeable odour of Hydrogen Sulphide; and when fused with a mixture of Sodium Carbonate and sufficient Potassium Nitrate to oxidise it, yields a mass which, when dissolved in Water and filtered, affords with Barium Chloride Solution a heavy white precipitate insoluble in Hydrochloric or Nitric Acid, or in a mixture of both.

The more generally occurring impurities are Arsenic and siliceous matter. The Pharmacopœia stipulates that it should not yield more than slight characteristic reactions with the Arsenic tests. The Belgian Pharmacopœia is more precise, and requires that 1 gramme, shaken with 10 c.c. of Hydrochloric Acid until disengagement of gas ceases, mixed with 5 c.c. of Water, and cautiously heated on a water-bath with some crystals of Potassium Chlorate; the mixture, when freed from Chlorine, filtered through an asbestos plug and evaporated to 3 c.c., shall yield no brown coloration in one hour, when mixed with an equal volume of Stannous Chloride Solution. The *P.G.* and Austr. Ph. do not allow more than 1 p.c. of residue insoluble in concentrated Hydrochloric Acid.

Hydrochloric Acid.—2 grammes of the powdered salt are dissolved on warming gently with 20 c.c. of Hydrochloric Acid, and then, on boiling for 1 hour, should leave a residue amounting to not more than 0·02 gramme, *P.G.*

ANTIMONIUM SULPHURATUM. Sulphurated Antimony.

N.O.Syn.—Kermes Mineral. Stibium Sulfuratum Aurantiacum.

Fr., Pentasulfure d'Antimoine; Ger., Goldschwefel; Span., Azufre Dorado de Antimonio.

An orange-red, odourless, tasteless powder, which consists of a mixture of Antimony Penta- and Tri-sulphides and -oxides, and containing also some free Sulphur. It should be preserved from the light.

It is officially stated to be prepared by boiling 10 parts each of Antimonious Sulphide and Sublimed Sulphur for two hours with a solution of 5 parts of commercial Sodium Hydroxide in 100 parts of Distilled Water, stirring frequently; the volume of the liquid is maintained by the occasional addition of Distilled Water. Whilst still hot, add 180 parts of boiling Distilled Water, strain through calico, and add gradually diluted Sulphuric Acid in slight excess to the strained liquid. Collect the precipitate on calico, wash with Distilled Water till the washings are free from Sulphates, and dry at a temperature not higher than 100° C. (212° F.).

Solubility.—Insoluble in Water; dissolves readily in Sodium Hydroxide solution, also in hot Hydrochloric Acid evolving Hydrogen Sulphide.

Medicinal Properties.—Alterative, diaphoretic, and emetic; powerfully depressant; uncertain in action from its slight solubility, depending on the acidity of the stomach. Usually prescribed with Calomel and Guaiacum, as in Pilula Hydrargyri Subchloridi Composita, as a cholagogue in gout; for secondary syphilis and its cutaneous eruptions; or with Henbane or Hemlock in chronic rheumatism.

Objection taken (*L.* '05, i. 1610) to the use of red Antimony Sulphide in the composition of red india-rubber. The investigation arose from a case of appendicitis where a large quantity of liquid was in the habit of being drunk from bottles fitted with stoppers having a red rubber ring round them.

It is pointed out (*L.* '05, i. 1736) that this Sulphide is soluble with difficulty except in hot strong acids or strong alkali, and a series of experiments carried out with a number of the more generally occurring beverages showed that they possessed no solvent action as regards Antimony when left in contact with red rubber rings containing 16·83 p.c. of that substance.

Dose.—1 to 2 grains = 0·06 to 0·13 gramme.

Official Preparation.—Contained in Pilula Hydrargyri Subchloridi Composita.

Foreign Pharmacopœias.—Official in Austr., Belg., Hung. and Swiss (Stibium Sulfuratum Aurantiacum), Dan. and Dutch (Sulfidum Stibicum), Fr. (Pentasulfure d'Antimoine), Ger., Jap. and Russ. (Stibium Sulfuratum Aurantiacum), Mex. (Sulfuro Antimonico), Norw. (Sulfuretum Stibicum), Port. (Enxofre Dourado de Antimonio), Span. (Azufre Dorado de Antimonio), Swed. (Kermes Mineralis). Swiss has also Stibium Sulfuratum Rubeum.

Tests.—Sulphurated Antimony yields the tests distinctive of Antimony appearing under Antimonious Oxide; when treated with Hydrochloric Acid it evolves a disagreeable characteristic odour of Hydrogen Sulphide, and a separation of Sulphur occurs; and when fused with Potassium or Sodium Carbonate and sufficient Potassium Nitrate to effect oxidation, the product, when dissolved in Water and filtered, yields a solution giving with Barium Chloride Solution a dense white precipitate insoluble in concentrated Hydrochloric Acid or in Nitric Acid, or in a mixture of both.

The official gravimetric test requires that when 3 grammes of the Sulphide are fully oxidised with Nitric Acid, 2 grammes of Antimonic Oxide should be produced. It has been pointed out (*Y.B.P.* '07, 473) that it will not yield this amount of residue by this test, and it has been suggested that it should be modified so as to read, 3 grammes moistened with dilute Nitric Acid, with successive portions of fuming Nitric Acid until red fumes cease to be evolved, the excess of Water then evaporated off, and carefully heated to redness, to expel Sulphuric

Acid, should leave a whitish residue weighing not less than 1·6 and not more than 1·8 grammes. It is shown that a sample containing as much as 30 per cent. of anhydrous Sodium Sulphate yielded a figure for residue very close to that obtained from a genuine and carefully prepared sample.

The more generally occurring impurities are Arsenic, siliceous matter, Chlorides and Sulphates. The *B.P.* employs the ordinary tests for Arsenic. The *P.G.* uses saturated aqueous Ammonium Carbonate Solution for the extraction of the Arsenic, and states that when this solution is supersaturated with Hydrochloric Acid no yellow flocculent precipitate should be thrown down in six hours. The Belgian Pharmacopœia gives an Arsenic test similar to that recorded under Antimonious Sulphide. The tests described in small type below, under the heading of Silver Nitrate and Barium Nitrate, serve to detect Chlorides and Sulphates if present.

Ammonium Carbonate Solution.—Allow a mixture of 0·5 gramme of Sulphurated Antimony with 5 c.c. of an aqueous Solution of Ammonium Carbonate saturated at ordinary temperatures, to stand for 2 minutes with occasional agitation at a temperature of 50° to 60° C. (122° to 140° F.). In the solution so obtained after filtration, and saturation with Hydrochloric Acid, a yellow flocculent precipitate should not be thrown down within six hours, *P.G.*

Silver Nitrate.—1 gramme Sulphurated Antimony when agitated with 20 c.c. of Water and filtered, gives a filtrate which on the addition of Silver Nitrate T.S. should become only faintly opalescent, but should not become brown, *P.G.*

Barium Nitrate.—The filtrate obtained as above should not immediately become cloudy on the addition of T.S. of Barium Nitrate, *P.G.*

Not Official.

LIQUOR ANTIMONII CHLORIDI.—A yellowish-red liquid, sp. gr. about 1·47. A powerful escharotic.

ANTIMONIUM TARTARATUM.

TARTARATED ANTIMONY.

B.P.Syn.—Potassio-Tartrate of Antimony; Tartar Emetic.

Fr., Antimoniotartrate Acide de Potassium; Ger., Brechweinstein
Ital., Tartaro Emetico; Span., Tartrato Antimonico Potasico.

$[K(SbO)C_4H_4O_6]_2H_2O$, eq. 659·14.

N.O.Syn.—Tartarus Stibiatus.

Colourless, odourless, transparent rhombic crystals, or as a heavy white powder. Taste at first sweet, then nauseous and metallic.

It should be preserved in well-stoppered bottles of a dark amber colour.

Solubility.—1 in 17 of Water (slowly); 1 in 2 of boiling Water; sparingly soluble in Alcohol (60 p.c.); insoluble in Alcohol (90 p.c.).

Medicinal Properties.—Diaphoretic, expectorant, alterative, emetic, circulatory and nervous depressant. Useful in the head symptoms of acute febrile diseases and in delirium tremens; contraindicated in asthenic cases; alterative in chronic skin affections and in gout.

As a diaphoretic and expectorant, it is given with great effect in the early stage of acute pneumonia, bronchitis and croup.

Externally, in the form of **ointment**, it acts as a powerful counterirritant, producing a pustular eruption.

Too purgative and depressant for use in lowering blood pressure.—*B.M.J.* '06, ii. 1451.

A review of post-mortem examinations, after death from the administration of tartar emetic.—*B.M.J.* '03, i. 873.

Dose.—As a diaphoretic, $\frac{1}{24}$ to $\frac{1}{8}$ grain = 0·003 to 0·008 gramme; as an emetic, 1 to 2 grains = 0·06 to 0·13 gramme.

Ph. Ger. maximum single dose, 0·2 gramme; maximum daily dose, 0·6 gramme.

Prescribing Notes.—*Best prescribed in aqueous solution or as the Vinum. In* pill, *well triturated with Milk Sugar and Diluted Glucose q.s.*

Incompatibles.—Tannic Acid, the Alkalis and their Carbonates, and Lead salts, Astringent infusions, as Cinchona, Rhubarb, etc.

Official Preparation.—Vinum Antimoniale.

Not Official.—Unguentum Antimonii Tartarati.

Antidotes.—Stomach-tube or emetics, Tannic Acid, Catechu, vegetable astringents, Tea or Coffee; stimulants if much collapse.

Foreign Pharmacopœias.—Official in Austr. (Stibium Kalio-Tartaricum); Belg. (Tartarus Stibiatus); Dan., Nor. and Swed. (Tartras Stibico-Kalicus); Dutch (Tartras Kalico-Stibicus); Fr. (Antimoniotartrate Acide de Potassium); Ger. and Swiss (Tartarus Stibiatus); Hung. (Kalium Stibio-Tartaricum); Ital. (Tartrato di Antimonio e di Potassio); Mex. (Tartrato de Potassio y antimonio); Port. (Tartrato de Potassa e de Antimonio); Jap. and Russ. (Stibio-Kalium Tartaricum); Span. (Tartrato Antimonico Potasico); U.S. (Antimonii et Potassii Tartras).

Tests.—Tartarated Antimony should answer the tests distinctive of Antimony given under Antimonious Oxide; after separation of the Antimony it should also give a yellow crystalline precipitate with Platinic Chloride Solution, and a residue of Platinum and Potassium Chloride when this precipitate is ignited; when moistened with Hydrochloric Acid and introduced into a Bunsen flame it should communicate a violet coloration readily distinguished when viewed through a blue glass; it should give a white precipitate soluble in moderately concentrated Potassium Hydroxide Solution, when an aqueous solution is tested with Calcium Chloride Solution; with Silver Nitrate Solution a white precipitate soluble in Ammonia Solution, the ammoniacal solution yielding a precipitate of metallic Silver when the solution is boiled; the precipitate is also soluble in Nitric Acid; a purple or violet colour should be produced when to its solution acidulated with Acetic Acid, a drop or two of Ferrous Sulphate Solution is added, followed by a few drops of Hydrogen Peroxide Solution, and then an excess of Potassium Hydroxide

Solution. The *B.P.* states that an aqueous solution is not precipitated by Gallic Acid, but this is contrary to general experience. A note in reference to this will be found under Gallic Acid. It is officially required to indicate not less than 99·19 p.c. and not more than 100·02 p.c. of the pure salt as ascertained by titration with Deci-normal Volumetric Iodine Solution; an excess of Sodium Bicarbonate being maintained throughout the operation in order to neutralise the Hydriodic Acid produced during the reaction. The Sodium Bicarbonate must be added not long before the titration or the Antimony will be precipitated. A weighed quantity of 1 gramme when mixed with about 3 times its weight of Sodium Bicarbonate and dissolved in Water should require not less than 60·2 nor more than 60·7 c.c. of the Volumetric Solution.

The *U.S.P.* Volumetric test indicates not less than 99·5 p.c. of the pure salt, the *P.G.* indicates 99·6 p.c.; both processes are compared in small type below under the heading Volumetric Determination.

It is officially required that 1·66 grammes should slowly dissolve without leaving a residue, in 25 c.c. of Water at 15·5° C. (60° F.).

The more generally occurring impurities are Ammonium salts, Arsenic, Calcium, Copper, Iron, Lead, Sodium, Chlorides, Sulphates and Potassium Acid Tartrate. In the *B.P.* these are grouped collectively. The more important are Arsenic, Copper and Lead; Iron and Potassium Acid Tartrate. Both *U.S.P.* and *P.G.* adopt the Bettendorf's test for Arsenic. Heavy metals, *e.g.*, Copper, Lead and Iron may be detected by adding to an aqueous solution sufficient Potassium or Sodium Hydroxide Solution to redissolve the precipitate at first formed and then passing Hydrogen Sulphide into the liquid. Chlorides and Sulphates respond to the usual tests; Potassium Acid Tartrate may be detected by the effervescence produced on adding Sodium Bicarbonate Solution. The *P.G.* includes a test for Arsenic, but for no other impurity. The 1 in 100 aqueous solution acidified with Acetic Acid should be unaffected by Ammonium Oxalate Solution, indicating the absence of Calcium. The *U.S.P.* includes a separate test for Iron, which is given in small type under the heading of Potassium Ferrocyanide Solution.

Residue.—On heating to 110° C. (230° F.) it loses its Water of crystallisation (2·71 p.c.) and at a red heat chars, emitting an odour resembling that of burning Sugar, and leaving a black residue with an alkaline reaction, *U.S.P.*; it chars on heating, *P.G.*

Potassium Ferrocyanide Solution.—An aqueous 1 in 100 solution acidulated with Acetic Acid should be unaffected by T.S. of Potassium Ferrocyanide, *U.S.P.*

Stannous Chloride Solution.—A mixture of 1 gramme Tartarated Antimony and 3 c.c. Stannous Chloride Solution should not assume a dark colour in the course of an hour, *P.G.*; 2 grammes dissolved in 5 c.c. Hydrochloric Acid should not respond to Bettendorf's test for Arsenic, *U.S.P.*

Hydrogen Sulphide Solution.—If sufficient solution of Sodium Hydroxide be added to an aqueous solution (1–20) of Tartarated Antimony to redissolve the precipitate first formed, and then an equal volume of freshly prepared Hydrogen Sulphide Solution added, no coloration should be noticeable after standing in a warm place for half an hour, when viewed by reflected light, holding it against a white surface, indicating absence of heavy metals, *U.S.P.*

Sodium Bicarbonate or Carbonate.—No effervescence should occur with Solution of Sodium Bicarbonate, *B.P.*; Solution of Sodium Carbonate, *U.S.P.* Absence of Acid Potassium Tartrate

Volumetric Determination.—1 gramme is dissolved in sufficient Water to measure 100 c.c., then 33 c.c. of this solution should, after the addition of 20 c.c. of a cold saturated aqueous solution of Sodium Bicarbonate and a little Starch T.S., require not less than 19·9 c.c. of Tenth-normal Iodine V.S. to produce a permanent blue colour (each c.c. corresponding to 5 p.c. of the pure salt). Titration should begin immediately after the addition of the Sodium Bicarbonate Solution, *U.S.P.* A solution of 0·2 gramme of Tartarated Antimony and 0·2 gramme of Tartaric Acid in 100 c.c. of Water should after the addition of 2 grammes of Sodium Bicarbonate and a few drops of Starch Solution, require 12 c.c. Tenth-normal Solution of Iodine to produce a blue colour, *P.G.*

Preparation.

VINUM ANTIMONIALE. ANTIMONIAL WINE.

Tartarated Antimony, 40 grains; boiling Distilled Water, 1 fl. oz.; Sherry, *q.s.* to yield 20 fl. oz.

Boiling Water is added to dissolve the Tartarated Antimony, as recommended in former editions of the *Companion.*

Dose.—10 to 30 minims = 0·6 to 1·8 c.c.; as an emetic, 2 to 4 fl. drm. = 7·1 to 14·2 c.c.

Contains 1 grain in 240 minims.

Foreign Pharmacopœias.—Official in Belg., Dutch, Ger. and Jap. (Vinum Stibiatum), 1 in 250; Mex. (Vino estibiado), 1 in 300; Span. (Vino Emetico), 1 in 250; Russ. (Vinum Stibio-Kalii Tartarici), 1 in 250; U.S. (Vinum Antimonii), 1 in 250; all with Sherry. Austr. (Vinum Stibii Kalio-Tartarici), 1 in 250; Hung. (Vinum Stibiato-Tartaricum), 1 in 240; Swiss (Vinum Stibiatum), 1 in 250; all with Malaga Wine. Port. (Vinho Antimonial), 1 in 200 of Port Wine. All by weight, except U.S. Not in Dan., Fr., Ital., Norw. or Swed.

Tests.—Antimonial Wine has a specific gravity of about 1·006; it contains about 4·75 p.c. w/v of total solids and about 19 p.c. w/v of Absolute Alcohol.

Not Official.

UNGUENTUM ANTIMONII TARTARATI.—Tartarated Antimony, in fine powder, 1; Simple Ointment, 4.—*B.P.* 1885.
This has been incorporated in the *B.P.C.*

ANTIPYRINE.

See PHENAZONUM.

Not Official.

APIOL.

An oily liquid, with a peculiar odour and disagreeable taste, obtained from the Fruits of *Apium Petroselinum*, L. (Parsley).

Medicinal Properties.—It is useful in amenorrhœa and dysmenorrhœa.

Dose.—3 to 5 minims = 0·18 to 0·3 c.c.

Prescribing Note.—*Usually given in* **capsules.**

Foreign Pharmacopœias.—Official in Fr., Mex. and Port. (Apiol), Dan. and Norw. (Ætheroleum Petroselini), Swed. includes Fructus Petroselini, and an Aqua of it.

Apiol was described by Messrs. Joret and Homolle, who introduced the substance into medicine, as a yellow, oily, non-volatile liquid, but the Apiol obtained by us from the Homolle capsules, although yellow in colour, was volatile in the vapour of Water to the extent of 95 p.c. Witney went into the subject in 1880, and describes Apiol as an impure Essential Oil of Parsley containing minute quantities of soft resin, and the Apiol of Homolle as the Essential Oil of Parsley Seeds with small traces of a soft resin. The Essential Oil of Parsley is a yellow, oily liquid, and as such has been made official in the Danish and Norwegian Pharmacopœias.

Arising out of a discussion as to what should be the colour of liquid Apiol, it was suggested in *C.D.* '94, ii. 17, that it was simply an alcoholic extract of Parsley Seeds; but this product is green, and contains but a small proportion (under 15 p.c.) of the Essential Oil of Parsley.

The stearoptene from the Oil is known as **Crystallised Apiol.**

Not Official.

APOCYNUM.

Syn.—Canadian Hemp.

The dried Rhizome of *Apocynum Cannabinum*, L., is official in U.S.

Medicinal Properties.—It has been used in the United States for some years as a cardiac tonic, and diuretic in cardiac dropsy. Also as a **fluid extract** (dose 5 to 15 minims = 0·3 to 0·88 c.c.) in pleurisy with effusion.

It also possesses emetic and cathartic properties; but as it is a drastic purgative, it should be given with some caution.

The diuretic action of Canadian Hemp was favourably considered, although it was admitted that it might produce violent emesis and catharsis. These undesirable results were, however, attributed to the admixture of the bitter fibre of the wood with the bark of the root.—*B.M.J.* '97, ii. 1714.

In 1 minim doses has been successfully employed (*L.* '05, ii. 955) in a case of incompetency and ascites, increased by 2 minims up to 10 minim doses 3 times daily, and subsequently reduced to 6 minims.

The most irritant of all cardiac tonics, and not a drug to be employed advantageously in medicine.—*B.M.J.* '06, ii. 1460.

Descriptive Notes.—The root is usually $\frac{1}{6}$ to $\frac{1}{8}$ inch (4 to 6 mm.) thick, cylindrical, somewhat angular, and longitudinally wrinkled with a few transverse fissures. It has an orange-brown bark, which becomes grey-brown on keeping, whitish or pinkish internally, nearly as thick as the woody portion, and contains large laticiferous vessels. The yellowish wood has several concentric rings, is finely radiate and coarsely porous, taste bitterish and somewhat acrid; it has scarcely any odour. The root of *A. androsæmifolium*, L., is sometimes confused with it, but it has a white porous wood and groups of stone cells in the outer part of the bark.

FLUIDEXTRACTUM APOCYNI.—100 of Apocynum in No. 60 powder is moistened with 40 of a mixture of Glycerin 10, Alcohol (95 p.c.) 60, and Water 30, packed in a percolator, then enough menstruum added to saturate the powder and leave a stratum above it, macerated for 48 hours, and percolation allowed to proceed slowly, gradually adding, first, the remainder of the menstruum, afterwards, a mixture of Alcohol (95 p.c.) 60 and Water 40, until the Apocynum is exhausted; reserving the first 90 of percolate and evaporating the remainder at a temperature not exceeding 50° C. (122° F.) to a soft extract which is dissolved in the reserved portion, and enough menstruum added to make 100. Average Dose.—1 c.c. (15 minims).—*U.S.P.*

This has been incorporated in the *B.P.C.*

TINCTURA APOCYNI.—Root, 1; Alcohol (60 p.c.), 10; by maceration.

Dose.—5 to 10 minims = 0·3 to 0·6 c.c.

This has been incorporated in the *B.P.C.*

APOCYNIN.—An amorphous resinous substance, almost insoluble in Water, but soluble in Alcohol (90 p.c.) and in Ether.

APOMORPHINÆ HYDROCHLORIDUM.

APOMORPHINE HYDROCHLORIDE.

FR., CHLORHYDRATE D'APOMORPHINE; GER., APOMORPHINHYDROCHLORID;
ITAL., CHLORIDRATO DI APOMORFINA; SPAN., CLORURO DE APOMORFINA.

$C_{17}H_{17}NO_2$, HCl, eq. 301·36.

White or greyish-white, odourless, minute, shining, needle-shaped crystals, which should be kept from the light in dark amber-coloured, thoroughly dry, glass bottles, and protected as far as possible from the air.

Apomorphine is obtained from Morphine by the abstraction of a molecule of Water, and Apomorphine Hydrochloride is prepared by heating Morphine or its Hydrochloride in sealed tubes with an excess of strong Hydrochloric Acid or with Zinc Chloride. The *B.P.* mentions Morphine or Codeine, but the product of the abstraction of a molecule of Water from Codeine is generally considered to be Apocodeine.

Solubility.—About 1 in 60 of Water; 1 in 50 of Alcohol (90 p.c.); nearly insoluble in Chloroform and in Ether; 1 in 100 of Glycerin.

The solubility in Water is given in *B.P.* as 1 in 50; minimum quantity of Water required for complete solution in 3 days at 60° F. is between 1 in 56 and 1 in 60, but if dissolved by the aid of a gentle heat it will remain in solution at 1 in 50. The aqueous solution, on being gently warmed, rapidly turns green.

The material used was recrystallised, air-dried, and powdered. It lost 3 p.c. of hygroscopic moisture on heating in a water-bath, which was exactly regained after 12 hours' exposure to air.

The solubility of Apomorphine Hydrochloride has been stated (*P.J.* '05, i. 230; *C.D.* '05, i. 282) to be 1 in 53 of Water, and 1 in 48 of Alcohol (90 p.c.). The *Companion* figures have been since shown to be quite correct in references to them in *P.J.* '06, i. 345; *C.D.* '06, i. 471.

Medicinal Properties.—The most reliable emetic, $\frac{1}{10}$ grain hypodermically, or $\frac{1}{5}$ grain by the mouth, usually acts promptly (2 or 3 minutes) without the production of much preceding nausea or depression, or unpleasant after-effects. As a **hypodermic injection** in cases of poisoning, especially if unable to swallow, and if emesis be indicated.

Invaluable as an expectorant in acute and chronic bronchitis with viscid secretion, and in croup; in bronchial irritation due to inhalation of factory dust, and in asthma.

As a hypnotic, $\frac{1}{30}$ grain hypodermically. As patients are occasionally susceptible to emetic action it is well to begin with $\frac{1}{50}$ grain, as a hypnotic.—*L.* '00, i. 1083.

Absolutely inert as an emetic in alcoholic poisoning.—*L.* '00, i. 1635.

In the acute stage of alcoholism, delirium tremens, 5 drops of the Injectio are generally sufficient to produce, within 5 minutes, several hours sleep. This dose can be repeated if necessary; the patient ought to be in horizontal position; occasionally, vomiting precedes the sleep. It is not a remedy for alcoholic craving.—*B.M.J.* '07, ii. 951.

As a hypnotic, hypodermically, in acute alcoholism, it has not received the recognition it deserves.—*M.R.* '07, ii. 144.

Dose.—$\frac{1}{20}$ to $\frac{1}{10}$ grain = 0·003 to 0·007 gramme, by hypodermic injection; by the mouth, $\frac{1}{10}$ to $\frac{1}{4}$ grain = 0·007 to 0·016 gramme.

Ph. Ger. maximum single dose, 0·02 gramme; maximum daily dose, 0·06 gramme.

Prescribing Notes.—*Its aqueous solution on keeping, or on being gently warmed, rapidly turns green. This green coloration is said to be due to the liberation of free Apomorphine by the alkalinity of the glass, and can be prevented by adding a few drops of dilute Hydrochloric Acid to the preparation. The official injection keeps fairly well for a month or so. Some authorities are of opinion that the Ammonia in the air causes the alkalinity.*

Official Preparation.—Injectio Apomorphinæ Hypodermica.

Not Official.—Hypodermic Discs, Haustus Apomorphinæ Compositus, Mistura Apomorphinæ et Terebeni, Pastillus Apomorphinæ et Codeinæ, and Syrupus Apomorphinæ Hydrochloridi.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Russ., Span., Swed., Swiss and U.S.

Tests.—The distinguishing tests of Apomorphine Hydrochloride are the production of a white precipitate, rapidly changing to green on exposure to air, when its aqueous solution is made alkaline with Potassium or Sodium Bicarbonate. The changed alkaloid is soluble in Alcohol (90 p.c.) producing an emerald green solution, in Chloroform producing a fine violet tint, and in Ether a purple coloration. An aqueous solution affords a precipitate with Mercuric-potassium Iodide (Mayer's) Solution, with Iodo-potassium Iodide (Wagner's) Solution, and with Mercuric Chloride Solution. The two following tests serve to distinguish Apomorphine Hydrochloride from Morphine on the one hand, and from Codeine, Narceine, and Narcotine on the other. The first is given in the *B.P.*, but without any explanation of its object; the second is peculiar to the *U.S.P.*: (1) Ferric Chloride Test-solution colours Apomorphine Hydrochloride Solution red, whilst Morphine yields a dull greenish-blue coloration. (2) A solution of 0·05 gramme of Apomorphine Hydrochloride when shaken with a solution of 0·05 gramme of Ferrous Sulphate in 10 c.c. of Water, gradually acquires a blue colour, changing after some time to a bluish-black; the original blue should be restored upon the addition of Alcohol (90 p.c.), but Carbon Bisulphide, Chloroform and Ether should remain colourless when shaken with the aqueous liquid.

An aqueous solution gives with Silver Nitrate Solution a white curdy precipitate insoluble in Nitric Acid; on the addition of Ammonia Solution, the precipitate dissolves, but its solution is immediately reduced.

A number of colour reactions for the identification of the alkaloid are given in small type below, and where possible comparison is made with statements appearing in the respective Pharmacopœias.

Apomorphine Hydrochloride and Pilocarpine Nitrate are two exceptions to the usual *B.P.* requirements, that the alkaloidal salt shall afford the tests distinctive of the individual acid radical entering into its composition.

The more generally occurring impurities are acidity, the presence of salt which has undergone decomposition, and mineral matter. Acidity is covered by the requirements of the three Pharmacopœias that the salt or its aqueous solution shall be neutral, or only very feebly acid to Litmus paper or solution. A salt which has been kept under unfavourable conditions, or which has been in stock for a long while, almost invariably contains a considerable amount of salt which has undergone change. The *B.P.*, *U.S.P.* and *P.G.* state that a salt, one part of which with 100 parts of Water yields an emerald green solution should be rejected; the *P.G.* further stating that a colourless or at most only a pale reddish liquid should result on shaking the dry salt with Ether. Neither the *B.P.* nor *U.S.P.* mention the likelihood of mineral matter being present, but *P.G.* states that the salt shall leave no residue on ignition.

Colour Tests.—With Nitric Acid it yields a blood red coloration *B.P.* and *P.G.*, fading to orange *U.S.P.*; with dilute Solution of Ferric Chloride it gives a deep red coloration *B.P.* and *U.S.P.* (distinction from Morphine which yields a blue colour).

U.S.P. also includes the following colour reactions which do not appear in *B.P.* or *Ger.*

Sulphuric Acid does not colour the salt, but with Sulphuric Acid containing (*a*) a trace of Selenious Acid it produces a dark blue colour fading to violet and then turning black; (*b*) a trace of Ferric Chloride, a pale blue colour; (*c*) a trace of Ammonium Vanadate, a violet blue colour, changing to deep greenish-blue; (*d*) a little Paraldehyde, a green colour, fading to reddish-brown; (*e*) Potassium Iodate, a black colour, changing to brown and finally to pale brown; (*f*) a trace of Nitric Acid, a blood red colour, fading to orange. A crystal of Apomorphine Hydrochloride and a crystal of Potassium Nitrate with Sulphuric Acid added are coloured red, and on stirring with a glass rod the solution becomes green, then blue, then purple, and finally cherry red. Acetic Acid dissolves the salt without colour, but on adding a trace of Potassium Iodate, the solution turns blood red, changes to purple, and on adding a little Ether and shaking, the latter assumes a blue colour. Gold Chloride T.S. produces a reddish purple precipitate in a solution of the salt.

Preparation.

INJECTIO APOMORPHINÆ HYPODERMICA. HYPODERMIC INJECTION OF APOMORPHINE.

Apomorphine Hydrochloride, 1 grain; Diluted Hydrochloric Acid, 1 minim; Distilled Water (recently boiled), *q.s.* to make 110 minims.

5 minims = $\frac{1}{22}$ grain Apomorphine Hydrochloride.

Dose.—5 to 10 minims = 0·3 to 0·6 c.c.

Not Official.

DISCS OF APOMORPHINE.—$\frac{1}{15}$ to $\frac{1}{10}$ grain dissolved in 6 to 10 minims of Distilled Water at the time of using subcutaneously.—*St. Bartholomew's.*

PASTILLUS APOMORPHINÆ ET CODEINÆ.—Apomorphine Hydrochloride, $\frac{1}{32}$ grain; Codeine, $\frac{1}{10}$ grain.—*Martindale* and *B.P.C.*

HAUSTUS APOMORPHINÆ COMPOSITUS.—Apomorphine Hydrochloride, $\frac{1}{10}$ grain; Diluted Hydrochloric Acid, 1 minim; Syrup of Squills, 60 minims; Oil of Turpentine, 10 minims; Mucilage of Gum Acacia, *q.s.*; Spirit of Ether, 10 minims; Distilled Water, to 1 fl. oz.—*Middlesex.*

MISTURA APOMORPHINÆ ET TEREBENI.—Apomorphine Hydrochloride, $\frac{1}{10}$ grain; Pure Terebene, 15 minims; Peru Balsam, 10 minims; Mucilage Mixture, to 1 oz.—*Guy's.*

SYRUPUS APOMORPHINÆ HYDROCHLORIDI. — Apomorphine Hydrochloride, 5 grains; Diluted Hydrochloric Acid, 15 minims; Alcohol (90 p.c.), 7 fl. drm.; Distilled Water, 7 fl. drm.; Syrup, to produce 20 fl. oz. Dissolve the salt in the Spirit and Water mixed, then add the Acid and the Syrup.—*B.P.C. Formulary* 1901.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Contains $\frac{1}{32}$ grain in 1 fl. drm.

This has been incorporated in the *B.P.C.* as follows:—

Syrupus Apomorphinæ.—Apomorphine Hydrochloride, 0·05; Diluted Hydrochloric Acid, 0·25; Alcohol (90 p.c.), 4·50; Distilled Water, 4·50; Syrup, *q.s.* to make 100.

This contains about $\frac{1}{36}$ grain in 1 fl. drm.

AQUÆ.

WATERS.

The Waters of the British Pharmacopœia, all of which are distilled, except Aqua Camphoræ and Aqua Chloroformi, are as follows; the formulas are given under the names of the substances from which they are prepared:—

AQUA ANETHI. From the dried ripe fruit.
AQUA ANISI. From dried ripe Anise fruit.
AQUA AURANTII FLORIS. From the flowers. Imported.
AQUA CAMPHORÆ.
AQUA CARUI. From the dried fruit.
AQUA CHLOROFORMI.
AQUA CINNAMOMI. From the bark.
AQUA DESTILLATA.
AQUA FŒNICULI. From the dried ripe fruit.
AQUA LAUROCERASI. From fresh leaves.
AQUA MENTHÆ PIPERITÆ. With oil and distilled.
AQUA MENTHÆ VIRIDIS. With oil and distilled.
AQUA PIMENTÆ. From the dried unripe fruits.
AQUA ROSÆ. From the fresh flowers.
AQUA SAMBUCI. From the fresh flowers. Imported.

In preparing distilled aqueous liquids only good, natural, potable Water must be employed, as directed for 'Distilled Water.'

In India and other tropical countries the Waters of Anethum, Anisum, Caruum, Cinnamomum, Fœniculum, Mentha Piperita, Mentha Viridis, and Pimenta, may be prepared from the oils without distillation, using 1 of Oil and 2 of Calcium Phosphate to 500 of Distilled Water.

AQUA DESTILLATA.

DISTILLED WATER.

FR., EAU DESTILLÉE; GER., DESTILLIRTEWASSER; ITAL., ACQUA DISTILLATA; SPAN., AGUA DESTILADA.

A clear, colourless, odourless, tasteless, neutral, limpid liquid, obtained by distilling good natural Water of a potable quality.

Foreign Pharmacopœias.—Official in all.

Tests.—Distilled Water at the normal temperature and pressure boils at 100° C. (212° F.), and should evaporate leaving scarcely a weighable residue. It should possess neither taste nor odour, and should be perfectly neutral. It may contain as impurities various metals, dissolved solids, Chlorides, Nitrates, Nitrites, Sulphates, organic matter, and Ammonia, all of which are specially mentioned in the *B.P.* The *U.S.P.* and *P.G.* examine for heavy metals. The *P.G.* and *U.S.P.* include a test for Carbonic Acid gas. The quantities used by the *B.P.* (25 c.c.) and by the *P.G.* (10 c.c.) for the determination of the amount of solid residue are ridiculously small, the *U.S.P.* quantity (1000 c.c.) is much more to the point, and admits of a quantitative determination. The tests for Chlorides, Nitrates, Nitrites, and Sulphates given in the *B.P.* are those mentioned in the Appendix, but with the exception of those for Chlorides and Sulphates are too crude unless specially applied. The *U.S.P.* employs the Diphenylamine test for Nitrates, requiring that no blue colour shall be produced; and the Sulphanilic Acid and Naphthylamine Acetate test for Nitrites, stipulating that no pink coloration shall be produced in 5 minutes. The *B.P.* test for Ammonia is carried to the other extreme, and is described with more minuteness than its importance justifies. The *B.P.*, *U.S.P.* and *P.G.* employ 100 c.c. of Distilled Water in carrying out the test for readily oxidisable organic impurities with Potassium Permanganate Solution, but the relative quantities of Sulphuric Acid and Potassium Permanganate vary, as does also the time of boiling. The *B.P.* and *P.G.* tests coincide pretty closely, with the exception of the relative strengths of the diluted Sulphuric Acid official in each Pharmacopœia. Both boil for 3 minutes, and at the end of this time the liquid should retain its pink colour. The *U.S.P.* boils for 10 minutes, and requires in addition that the pink colour should not wholly disappear if the vessel is covered to protect it from dust and set aside in a dark place for 10 hours.

A detailed comparison of the tests adopted by the three Pharmacopœias for the detection of the above impurities is for convenience made in small type below.

Residue.—The *B.P.* requires that the residue left on the evaporation of 25 c.c. should be scarcely visible; the *P.G.* states that 10 c.c. of Distilled Water when evaporated should not leave a weighable residue; and the *U.S.P.* that 1000 c.c. of Distilled Water, after evaporation to dryness on a water-bath, should not leave more than 0·050 gramme of residue.

Silver Nitrate.—It should not be affected by Silver Nitrate T.S., indicating the absence of Chlorides, *P.G.* and *U.S.P.*

Mercuric Chloride.—It should not be affected by solution of Mercuric Chloride, *P.G.*

Barium Chloride.—It should not yield the slightest turbidity on the addition of Barium Chloride T.S., indicating the absence of Sulphates, *U.S.P.*

Ammonium Oxalate.—No turbidity should result on the addition of Ammonium Oxalate T.S., indicating the absence of Calcium, *U.S.P.*

Hydrogen Sulphide.—It should not be affected by Hydrogen Sulphide T.S., even after the addition of Solution of Ammonia, *P.G.* It should not respond to the time-limit test for heavy metals, *U.S.P.*

Calcium Hydroxide.—When mixed with twice its volume of Lime Water it should remain clear, indicating the absence of Carbonic Acid, *P.G.* and *U.S.P.*

Diphenylamine.—If 10 c.c. of Distilled Water mixed with a few drops of Diphenylamine T.S. be carefully poured upon about 3 c.c. of Sulphuric Acid free from Nitrous compounds, contained in a test-tube, so as to form a separate layer, no blue colour should be formed at the line of contact of the two liquids, *U.S.P.*

Sulphanilic Acid and Naphthylamine Acetate.—If to 50 c.c. of Water contained in a glass cylinder 2 c.c. each of Sulphanilic Acid T.S. and Naphthylamine Acetate T.S. are added, and the solution well mixed, no distinct pink coloration should appear within 5 minutes, if the cylinder be placed upon a white surface and viewed from above, *U.S.P.*

Mercuric Potassium Iodide.—The *B.P.* requires that it shall not contain more than 0·005 part per million, equivalent to 0·00035 grain per gallon, of Ammonia as determined by the colour produced when 2 c.c. of Potassio-mercuric Iodide (Nessler's) Solution is added to 100 c.c. of the Water; the colour is compared with that produced by 0·25 c.c. of Nessler's Ammonium Chloride Solution diluted with 50,000 c.c. of Ammonia-free Water. A somewhat similar test is given in the *U.S.P.*, which uses 50 c.c. of Distilled Water and 2 c.c. of reagent. This should not yield a yellow or brownish tint when contained in a glass cylinder placed on a white surface and viewed from above. The *U.S.P.* does not, however, direct the use of a comparative test.

Potassium Permanganate.—If 100 c.c. of Water be heated to boiling with 1 c.c. of Diluted Sulphuric Acid (the *U.S.P.* uses 10 c.c. of Diluted Sulphuric Acid) and solution of Potassium Permanganate be added and the mixture boiled for 3 minutes (10 minutes *U.S.P.*), the liquid should not be decolorised, *B.P.*, *U.S.P.* and *P.G.* The *B.P.* states that the liquid should retain its colour for 1 hour, and the *U.S.P.* that the colour should not be completely destroyed by boiling for 10 minutes, nor should it wholly disappear if the vessel be afterwards set aside in a dark place and covered for 10 hours. The quantity of Potassium Permanganate Solution ordered in the *B.P.* is 0·1 c.c. of a mixture of 1 part solution of Potassium Permanganate (1 p.c.), and 2 parts of Water; in the *P.G.* 0·3 c.c. of a 0·1 p.c. w/w solution of the salt is used, and in the *U.S.P.* 0·1 c.c. of a Tenth-normal Volumetric Solution is used.

ARAROBA.

ARAROBA.

B.P.Syn.—Goa Powder; Crude Chrysarobin.

Fine powder, or in more or less agglomerated particles; yellow when first obtained, but rapidly becoming of a dull ochre or brown colour. Obtained from fissures in the trunk of *Andira Araroba*, Aguiar and freed from woody fragments.

Descriptive Notes.—The crude drug of commerce is usually of an umber-brown colour but yellowish internally and more or less mixed with, or attached to, pieces of the heart-wood of the tree. From these pieces it should be freed and then dried and powdered, and it may then vary in colour from brownish-yellow to umber-brown. Samples which have been imported in a damp condition and exposed to atmospheric Ammonia become deep brown or purple. It varies much in the amount of wood it contains. Good specimens yield as much as 80 p.c. of soluble matter to Benzol or Chloroform.

Official Preparation.—Used to prepare Chrysarobin.

Tests.—Araroba should be soluble in hot Chloroform to the extent of not less than 50 p.c., and when the solution is filtered and evaporated to dryness, the powdered residue is known as Chrysarobin.

Not Official.

ARECA.

The Seed of the *Areca Catechu*, L., the betel-nut tree. Imported from the East Indies.

Medicinal Properties.—Astringent, narcotic, anthelmintic. A remedy for tapeworm. 60 grains = 4 grammes, of powdered Areca Nut made into a ball with Honey, answers well as a vermifuge for a large dog. A paste is made of the powder for a dentifrice.

Areca Nut Charcoal used also as a dentifrice.

Foreign Pharmacopœias.—Official in Ger. and Swiss, Semen Arecæ.

Descriptive Notes.—The seeds of the Areca palm vary a good deal in size and somewhat in shape. In size they vary from 1 to 1½ inches (25 to 37 mm.) in diameter in the broadest part; the transverse section is white marbled with brown, owing to the infolding of the seed coat in the albumen. The taste is astringent and slightly acrid. The hemispherical or rounded fruits, derived from the variety *alba*, are much less active as a vermifuge than the conical or typical form. The larger and more mature seeds are to be preferred to the smaller for medicinal use.

ARECOLINÆ HYDROBROMIDUM.—Fine white needles, readily soluble in Water and in Alcohol (90 p.c.), difficultly soluble in Ether and in Chloroform.

Sialagogue, diaphoretic and anthelmintic. ½ p.c. solution applied to the eye produces tingling followed by myosis. Maximum effect in from 10 to 15 minutes, lasts about one hour. Administered internally causes vomiting and diarrhœa.—*B.M.J.* '99, i. 82.

Dose.—$\frac{1}{120}$ to $\frac{1}{64}$ grain = 0·0006 to 0·001 gramme, to be given with caution.

Foreign Pharmacopœias.—Official in Fr., Ger., Swed. and Swiss.

Tests.—It should have a melting point of 167° C. (332·6° F.); *Fr. Codex* gives 170° C. (338° F.). A 1 in 10 aqueous solution of the salt yields a brown precipitate with Iodine Solution, a brown precipitate with Bromine Water, and a light yellow precipitate with Silver Nitrate Solution, but none with Platinum Chloride Solution, Mercuric Chloride Solution, or Tannic Acid Solution. It should leave no residue when ignited with free access of air.

ARGENTI NITRAS.

SILVER NITRATE.

B.P.Syn.—LUNAR CAUSTIC.

$AgNO_3$, eq. 168·69.

FR., AZOTATE D'ARGENT; GER., SILBERNITRAT; ITAL., NITRATO DI ARGENTO; SPAN., NITRATO ARGENTICO CRISTALIZADO.

Colourless, transparent, tabular, rhombic crystals. It should be kept in well stoppered, dark amber-coloured vials protected from the light and dust.

Solubility.—100 grains in 50 minims of Water, measuring 80 minims; 1 in 18 of Alcohol (90 p.c.). Insoluble in strong Nitric Acid.

Medicinal Properties.—Astringent, sedative, antispasmodic. It is useful in hæmatemesis, gastric ulcer, diarrhœa, and cholera, as well as in chronic nervous irritability of and pain in the stomach; also in some nervous diseases, as epilepsy, chorea and locomotor ataxy. It is employed in chronic dysenteric ulcers as an **enema**, 60 grains dissolved in 60 oz. of Water, after clearing away the contents of lower bowel, and as a **bougie** in chronic gonorrhœa. A dark line on the edges of the gums, removable by a course of Acid Tartrate of Potassium, precedes the indelible discoloration of the skin and mucous membranes (argyria), produced by the long-continued internal administration of this salt. Its administration should be interrupted for fourteen days at the end of two or three months, however small the dose. More than 100 grains per month should not be given.

Externally as a local stimulant to weak and callous ulcers, fistulæ, and aphthous affections of the mouth; as a caustic to warts and poisoned wounds. As a local application to prevent pitting in smallpox, and to relieve the itching in pruritus; it is also applied, under Cocaine, to ulcers of the cornea. 1 to 3 grains to the oz. is employed for **lotions** and **collyria**, in all forms of conjunctivitis and both as a prophylactic and curative in ophthalmia neonatorum, and as an injection in urethritis, cystitis, and vaginitis. For eczema or pityriasis of the ear, a 1 in 20 solution in Spirit of Nitrous Ether answers well. Hæmostatic for leech bites.

Chilblains are sometimes painted with a strong solution of Silver Nitrate.

A weak solution (1 in 500) for obstinate forms of eczema in children.—*L.M.R.* '88, 525.

In cholelithiasis.—*B.M.J.E.* '02, i. 99.

Powdered Silver Nitrate in antral empyema.—*B.M.J.E.* '99, i. 96.

A 2 p.c. solution of Silver Nitrate by far the best prophylactic in ophthalmia neonatorum.—*B.M.J.* '03, ii. 135; *L.* '03, ii. 163; a 4 grains to the oz. solution for treating the same, *Pr.* lxxv. 561; as a prophylactic, 1 p.c. is even more efficacious than the 2 p.c. advocated by Credé, whilst the inflammatory reaction is less marked, *L.* '07, ii. 538.

Intravenous injection of a 2 or 5 p.c. solution in the treatment of septic conditions.—*B.M.J.E.* '02, i. 12.

Strong Solution of Potassium Iodide, or Potassium Cyanide, has been suggested for the removal of the black stains on the skin produced by Silver Nitrate.

Dose.—$\frac{1}{4}$ to $\frac{1}{2}$ grain = 0·016 to 0·032 gramme.

Prescribing Notes.—*Prescribed in* **pills** *with Massa Kaolini. Solutions should be dispensed in stoppered bottles.*

For application to the skin, a **solution** *in Spirit of Nitrous Ether has been recommended. This solution throws down a light coloured precipitate, but does not itself become black like a simple spirituous solution. It, however, blackens the skin in a shorter time.*

Incompatibles.—The Alkalis and their Carbonates and Alkaloids; all Bromides, Chlorides, Iodides, and Phosphates; Solutions of Arsenic, and Tannin.

Official Preparations.—Argenti Nitras Induratus and Argenti Nitras Mitigatus. Used in the preparation of Argenti Oxidum.

Not Official.—Mild Caustic Points, Argenti Iodidum Nascens, Argentum Foliatum, Actol, Albargin, Argentamin, Argentol, Argonin, Argyrol, Collargol, Ichthargan, Itrol, Largin, Novargan, Protargol, and Tachiol.

Antidotes.—Aqueous solution of Common Salt; Milk or some demulcent drink given freely; Emetic; White of Egg.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Span., Swed., Swiss and U.S. Also fused Nitrate of Silver in all except Belg., Dan., Fr., Ger., Ital., Swed. and Swiss. Russ. now includes only a fused Nitrate.

Tests.—The distinguishing tests for Silver Nitrate are that its aqueous solution yields with Hydrochloric Acid or a soluble Chloride a white curdy precipitate insoluble in Nitric Acid but soluble in Ammonia Solution; Potassium Chromate Solution yields a red precipitate disappearing on the addition of a solution of a soluble Chloride, Bromide or Iodide, and destroyed by mineral acids; a solution of Ferrous Sulphate gently poured on to a well-cooled mixture of its aqueous solution and Sulphuric Acid, produces a brown or purplish-brown coloration at the junction of the two fluids; an aqueous solution warmed with Sulphuric Acid and a strip of Copper liberates red fumes. It is officially required to yield 84·3 p.c. of Silver Chloride as ascertained gravimetrically by precipitating 1 gramme of the salt with Hydrochloric Acid; the filtrate from the precipitate, when evaporated to dryness should leave no residue. The *P.G.* completely precipitates the Silver from 5 c.c. of an aqueous 1 to 20 solution by the addition of an excess of Hydrochloric Acid, and requires that the evaporated filtrate should leave no residue; the *U.S.P.* uses a 1 to 10 solution and requires that not more than 0·1 p.c. of residue should remain. The *B.P.* gravimetric test indicates 100·0 p.c. of the pure salt; the *U.S.P.* volumetric test indicates 99·98 p.c. of the pure salt; neither a gravimetric nor a volumetric determination is given in *P.G.* The *U.S.P.* test is performed with Deci-normal Volumetric Sodium Chloride Solution, the excess being titrated back with Deci-normal Volumetric Silver Nitrate Solution.

The more generally occurring impurities are Copper, Iron and Lead, Potassium, Sodium and Sulphates, all of which are mentioned in the *B.P.* Copper and Lead are the more important; the former is readily detected by the blue colour of the ammoniacal solution, the latter by the insoluble Sulphate thrown down on the addition of Sulphuric Acid.

Sulphuric Acid.—5 c.c. of an aqueous solution (1–10) with 20 c.c. of hot diluted Sulphuric Acid and heated to boiling should give no white precipitate (absence of Lead), *U.S.P.*

Volumetric Determination.—0·5 gramme of Silver Nitrate is dissolved in 10 c.c. of Distilled Water and well mixed with 30 c.c. Tenth-normal Volumetric Solution of Sodium Chloride and 3 drops of Potassium Chromate T.S. when not more than 0·4 c.c. Tenth-normal Volumetric Silver Nitrate Solution should be required to impart to the liquid a permanent red colour, *U.S.P.*

Preparations.

ARGENTI NITRAS INDURATUS. Toughened Caustic.

Silver Nitrate, 19; Potassium Nitrate, 1. Mix by fusion.

Foreign Pharmacopœias.—Belg. (Argenti Nitrici Styli); Fr. (Crayons d'Azotate d'Argent); Ital. (Nitrato d'Argento Fuso con Nitrato di Potassio); Mex. (Lapices de Nitrato de Plata); Span. (Nitrato Argentico Mitigado); all Silver Nitrate 9, Potassium Nitrate 1.

Argenti Nitras Fusus.—4 grammes of Hydrochloric Acid are added to 100 grammes of Silver Nitrate in a porcelain dish and melted at as low a temperature as possible, stirred well and poured into suitable moulds, which should be kept in dark amber-coloured vials protected from light.—*U.S.P.*

ARGENTI NITRAS MITIGATUS. Mitigated Caustic.

Silver Nitrate, 1; Potassium Nitrate, 2. Mix by fusion.

Foreign Pharmacopœias.—Official in Austr., Ger., Russ. and Swiss, 1 in 3; Jap., 1 in 2; all (Argentum Nitricum c. Kalio Nitrico). Dan. (Nitras Argenticus bis Mitigatus), 1 in 3; Norw. and Swed. (Nitras Argenticus Mitigatus), 1 in 3; Fr. (Crayons d'Azotate d'Argent

Mitigé), containing ½, ⅓, and ¼ of Nitrate of Silver; U.S. (Argenti Nitras Mitigatus), 1 in 3. Not in the others.

Mild Caustic Points, made by fusing Potassium Nitrate in various proportions with Silver Nitrate, are used by oculists and others.

Not Official.

ARGENTUM FOLIATUM (*Austr.*, *Belg.*, *Dan.*, *Dutch*, *Fr.*, *Ger.*, *Russ.* and *Swiss*).—Thin leaves of pure Silver, which dissolve in Nitric Acid, yielding a clear colourless solution.

ARGENTI IODIDUM NASCENS.—Freshly precipitated Silver Iodide has been recommended in conjunctival catarrhs.

Silver Iodide is a heavy, amorphous, yellowish powder, which should be kept in dark amber-coloured vials, protected from light.

ACTOL (Silver Lactate).—A white amorphous powder, or as colourless crystalline needles. Soluble 1 in 20 of Water. Introduced as an antiseptic. Useful as an injection (¼ to ½ grain per oz.) in gonorrhœa. The injection is attended with some pain.

Possesses no advantage for ophthalmic work over Silver Nitrate.—*B.M.J.* '01, ii. 1333.

ALBARGIN (Gelatose Silver; Silver Glutin).—Bright yellow powder, soluble in Water. Stated to be an active antiseptic.—*P.J.* '01, ii. 345.

ARGENTAMIN.—Silver Phosphate dissolved in Ethylenediamine solution. Antiseptic and astringent. A dilution of 1 to 4000 of Water has been recommended for urethral injection in gonorrhœa. As a 5 p.c. solution in ophthalmic work.—*B.M.J.E.* '95, ii. 20; '96, ii. 64; *L.* '95, ii. 47; *B.M.J.* '01, ii. 1333.

ARGENTOL.—A compound of Silver with Oxychinolin. A sparingly soluble yellowish powder, recommended as an antiseptic application to wounds and ulcers.—*P.J.* '97, i. 369; '98, ii. 342.

ARGONIN.—Is obtained by precipitating Silver Nitrate and Casein-soda with Alcohol. Contains about 4 p.c. of Silver. It is a fine white powder, soluble in Water. It is recommended as a disinfectant.—*P.J.* (3) xxv. 1193; *J.S.C.I.* '95, 1060; *L.* '95, ii. 47. A 2 p.c. aqueous solution gradually increased to 10 p.c., recommended in the treatment of gonorrhœa.—*B.M.J.E.* '96, ii. 64; *T.G.* '97, 740; *B.M.J.* '01, ii. 1333.

ARGONIN L.—Contains 10 p.c. Silver and is readily soluble. 1 p.c. solution used successfully in the treatment of anterior and posterior urethritis.—*B.M.J.E.* '99, i. 96.

ARGYROL.—Fine black glistening hygroscopic scales readily reduced to a powder. Readily soluble in Water forming a dark brownish-black solution; but insoluble in Alcohol (90 p.c.). It contains 30 p.c. of Silver combined with a protein extracted from wheat. 5 p.c. injections in acute gonorrhœa.—*L.* '03, ii. 1716. Instillations of 5 to 50 p.c. solutions are useful in ophthalmic work, and are painless.

In the treatment of ophthalmia neonatorum 1 or 2 drops of a 20 to 50 p.c. solution put into each eye is stated (*Pr.* lxxv. 561) to be certainly less irritating than, and quite as effective as, Silver Nitrate. Bacteriological experiments have shown that Argyrol is more effective in killing micro-organisms than Silver Nitrate in the strengths in which the latter can be tolerated in the eye.

In the form of 'drops' of a 25 p.c. solution it is of the greatest value in checking suppuration from the conjunctiva, and in some most unpromising cases it proved to be the best remedy.—*L.* '05, i. 1416.

An ointment containing 10 grains to the oz. of Vaseline is simply invaluable (*M.P.* '05, ii. 138) in eczematous conjunctivitis or keratitis complicated with marked photophobia, blepharospasm and watering of the eyes, and when the photophobia is very intense 2 to 4 grains of alkaloidal Atropine and a similar amount of alkaloidal Cocaine may with advantage be added to the prescription.

Of the three Silver compounds, Protargol, Collargol and Argyrol, the latter

(*L.* '06, ii. 14) gives the best results in acute conjunctivitis. It is the least irritating and possesses quite a wonderful power in lessening discharge and relieving pain. It can be used in as great a strength as 50 p.c., and may be applied as an ointment or solution. It is so non-irritating that it can safely be injected into the anterior chamber to control intraocular suppuration. It is the most valuable remedy we possess in the treatment of purulent ophthalmia, either in the adult or in the new-born child. It is also useful in blenorrhagia of the lachrymal passages.

Uses and limitations in eyework of Argyrol:—Great advantage, even in strong solution, over Silver Nitrate, lies in the fact that its application is painless, and that it can be used freely by the patient without risk.—*Scot. Med. and Surg. Jour.* '07, i. 396. In ophthalmia neonatorum, solutions of Argyrol are much better than strong solutions of Silver Nitrate, because they are practically inert, and therefore do not injure the conjunctival epithelium (*B.M.J.* '07, ii. 675); as an enema, in ulcerative colitis (*L.* '04, ii. 1209); yields good results applied as 20 p.c. solution in ophthalmia neonatorum (*B.M.J.* '04, ii. 1246); 25 p.c. solution applied in acute conjunctival cases, and great improvement followed application in a case of persistent ophthalmia.—*B.M.J.* '04, ii. 1633.

See also Summary given below.

COLLARGOL (Colloid Silver).—Black or greyish-black shining scales, with a metallic lustre. Soluble 1 in 2 of Water. Antiseptic and disinfectant. Employed in the form of a 15 p.c. ointment. Intravenously as an injection, 5 to 20 c.c. of a ½ to 1 p.c. solution. As a 1 to 5 solution in ophthalmic work.—*L.* '02, ii. 1800; *B.M.J.E.* '01, ii. 95; '02, ii. 16; *M.P.* '02, i. 85; *P.J.* '02, i. 115.

Of the three Silver compounds, Protargol, Collargol and Argyrol, Collargol is to be preferred (*L.* '06, ii. 14) in recent wounds of the eyeball, and is employed for the most part in the form of Gelatin wafers containing 10 p.c. of the drug. It is also used in the form of solution and as an ointment, the strength varying from 5 to 20 p.c.

ICHTHARGAN (Silver Thiohydrocarburo-sulphonate; Silver Ichthyolate).—A light brown, odourless, amorphous powder, containing 30 p.c. Silver. Soluble 1 in 6 of Water and in Glycerin, Insoluble in Alcohol (90 p.c.) and in Ether. Powerful antiseptic. Useful as an injection, 0·02 to 0·2 p.c., in gonorrhœa. 1 to 3 p.c. solution in affections of the posterior urethra.—*B.M.J.E.* '01, ii. 104; '02, ii. 16; '03, ii. 31; *P.J.* '01, ii. 299.

ITROL (Silver Citrate).—A white odourless powder, containing about 63 p.c. of Silver. Only slightly soluble in Water (1 in 4000). Antiseptic. Useful in gonorrhœa. As an injection (1 in 8000 to 1 in 4000 solution). As an insufflation. As a dusting powder for wounds. In the form of sticks for fistulæ, deep wounds, and endometritis:—Itrol, 2 to 5; White Wax, 1·0; Ol. Theobrom., 9; melt and divide into 30.—*P.J.* '96, i. 243; '97, ii. 254; *Pr.* lx. 292; *B.M.J.E.* '99, i. 99 *T.G.* '99, 631; *P.J.* '99, ii. 135; *B.M.J.* '01, ii. 1333.

Official in Swed.

LARGIN (Silver Albuminate).—A light brown, amorphous, odourless powder. Soluble 1 in 8 of Water. Contains 11 p.c. Silver. Introduced as an antiseptic. Useful in gonorrhœa as an injection (1 in 4000). It is stated to have given very satisfactory results in superficial eye-diseases, such as acute infectious ophthalmia in 3 to 10 p.c. solution. Inferior to the Nitrate or Protargol in gonorrhœal ophthalmia. Even saturated solution stated to cause no pain.—*B.M.J.* '00, i. 622; *B.M.J.E.* '00, i. 68; *P.J.* '00, i. 413.

NOVARGAN.—A fine yellow odourless powder, yielding neutral red-brown solutions with Water, which should be kept in non-actinic glass bottles. An antiseptic in gonorrhœa.

PROTARGOL (Silver Protein). — A light brown or yellow, odourless powder, possessing a disagreeable metallic taste. It should be preserved in well-stoppered glass bottles of a dark amber tint and protected as far as possible from the light. It is soluble 1 in 2 of Water. A powerful antiseptic and germicide possessing deep penetrating powers, and stated not to precipitate albumen. Has been recommended in ¼ to 2 p.c. solution as an unirritating and successful injection in gonorrhœa.—*B.M.J.E.* '97, ii. 96; '98, i. 40; '98, ii. 2; *Pr.* lx. 292

and 311; *L.* '97, ii. 1628; '98, i. 872; *B.M.J.E.* '99, ii. 56, 58; *L.* '02, i. 1525; *B.M.J.E.* '99, i. 24; '01, ii. 103; *B.M.J.* '07, i. 912; *F.T.* '07, 46. Irritant effect sometimes seen probably due to worthless imitations of Protargol, or to the solutions not being made up freshly and with cold Water.—*B.M.J.E.* '07, i. 72. In conjunctival affections in the form of a 5 to 10 p.c. solution.—*B.M.J.E.* '99, i. 8; *T.G.* '99, 318; *Pr.* lxiv. 476; *L.* '99, ii. 1046; '01, ii. 553. In gonorrhœal ophthalmia, 10, 20, and 30 p.c. solutions may be used.—*L.* '01, ii. 553; *B.M.J.* '01, ii. 1333. 1 p.c. solution never fails to cure.—*B.M.J.* '07, i. 912. Zinc Sulphate stated to be incompatible with Protargol.—*P.J.* '02, ii. 293. In phthisis, injection of 40 c.c. of saline solution containing 1½ to 2½ grains Protargol, preceded and followed by an injection (through the same needle) of a few c.c. of pure saline solution.—*Proc. Brit. Cong. on Tuber.* iii. 444; *L.* '01, ii. 309. 1¼ p.c. solution as an injection, and local application of a 10 to 20 p.c. solution to diseased area in urethral hæmorrhage in gonorrhœa.—*L.* '02, i. 1526. Two cases of argyrosis following the use of Protargol in conjunctivitis.—*L.* '02, ii. 1199. Injections of solutions of this salt, followed by astringents—*e.g.*, Zinc Chloride or Acetate—are considered (*L.* '04, ii. 1223) best in the treatment of gonorrhœa. 2 to 5 p.c. solutions are usually employed.—*Pr.* lxxiv. 225.

Of the three Silver salts, Protargol, Collargol and Argyrol, in chronic inflammation of the conjunctiva and the edges of the eyelids, Protargol, in from 10 to 25 p.c. solution or ointment brushed vigorously over the affected parts, produces far quicker and better results than are to be obtained by any other known method of treatment.—*L.* '06, ii. 13.

See also Summary below.

Prescribing Notes.—In preparing solutions of Protargol it is preferable to place the greater portion of the Water which is intended to be used into a vessel and then to introduce the Protargol, which dissolves gradually, finally adding the rest of the Water. Shaking should be avoided until solution is complete.

Foreign Pharmacopœias.—It is official in Austr., Belg., Jap. and Swiss.

Tests.—A 1 p.c. aqueous solution of Protargol is not precipitated by the addition of alkalis, Sodium Chloride Solution, or by Ammonium Hydrosulphide Solution. Hydrochloric Acid produces a precipitate soluble in excess of the reagent, and Picric Acid Solution yields a yellow precipitate. Solutions of Protargol yield the Biuret reaction when mixed with an equal volume of Potassium or Sodium Hydroxide Solution and a drop or two of a diluted Copper Sulphate Solution. It should leave on ignition about 8 p.c. of metallic Silver which should conform to the characteristic tests and freedom from impurities mentioned under 'Silver Nitrate.'

Liquor Protargol.—Protargol, 40, 80, 120, or 160 grains; Distilled Water, to 1 fl. oz.—*London Ophthalmic.*

TACHIOL (Silver Fluoride).—Colourless, transparent crystals, changing rapidly on contact with air. Readily soluble in Water, and the solutions, if not too strong, are permanent. Introduced as a new antiseptic. It is stated to possess powerful bactericidal powers, superior to Carbolic Acid, and only slightly inferior to Corrosive Sublimate. Employed in from a 1 in 1000 to 1 in 5000 solution to disinfect cavities and suppurating sinuses, in tubercular lesions, and ulcerative processes. It is also stated to have met with some success in ophthalmic practice, its non-irritating character being an advantage. Its solution, however, blackens linen fabrics.—*L.* '02, i. 393; ii. 1707; *C.D.* '02, i. 309. A 1 in 3000 to 1 in 5000 solution has been shown (*B.M.J.E.* '05, i. 24) to be an excellent antiseptic and antifermentative for the stomach, whether used for washing out or given internally.

Summary of Experiments with Organic Silver Compounds.—A series of experiments were carried out to determine the bactericidal action of Silver compounds, and the results were embodied in a report to the British Medical Association.—*B.M.J.* '06, ii. 359. The various Silver compounds investigated fall into three groups: (1) Those which are powerfully bactericidal; (2) one (Nargol) much less powerfully bactericidal; (3) two (Argyrol and Collargol) which possess practically no bactericidal action whatever. The first group includes most of the substances investigated, namely, Silver Nitrate, Silver Fluoride, Actol, Itrol, Argentamin, Argentol, Albargin, Argonin, Ichthargan, Largin, Novargan and Protargol. The bactericidal action of these in solutions containing the same percentage of combined Silver is closely similar, and it is practically impossible to place them in any order of activity which would be true under all circumstances.

As Argyrol and Collargol are not bactericidal, it is evident that the amount of Silver which a compound may contain is no criterion of its bactericidal power. Moreover, in view of the results obtained with Argyrol, it seems impossible to attribute the good effects which many clinicians have obtained with it to its bactericidal action.

Further investigations largely confirmatory of the above.—*B.M.J.* '07, ii. 1475; *L.* '07, i. 525, 675.

Silver Nitrate in eye diseases is a dangerous remedy, except in the hands of the surgeon, and its application even in a 2 p.c. solution is attended with such excruciating pain as to make the strongest shudder.—*Scot. Med. and Surg. Jour.* '07, i. 396.

ARGENTI OXIDUM.

SILVER OXIDE.

Ag_2O, eq. 230·10.

FR., OXYDE D'ARGENT; GER., SILBEROXYD.

A brownish-grey odourless powder when freshly prepared, but becoming of a blackish-brown colour on drying or on exposure to the air.

When mixed with readily oxidisable substances great heat is evolved, and the mixture is liable to explode.

It may be prepared by the interaction of solutions of Silver Nitrate and Calcium Hydroxide.

It should be preserved in dark amber-tinted dry bottles, and protected from dust and ammoniacal fumes.

Medicinal Properties.—It has the general therapeutic qualities of the Nitrate, without its escharotic effect. It is more slowly absorbed, and is said to be less liable to discolour the skin.

Dose.—½ to 2 grains = 0·032 to 0·13 gramme.

Prescribing Notes.—*Usually given in a* pill, *made with Massa Kaolini.*

If prescribed with Creosote or with the Chlorides in pills, the Oxide must be first diffused through some inert powder such as Kaolin, as the heat produced in rapidly reducing the Silver or by the Chlorine combining with it causes the mass to become red-hot, or to explode.

Incompatibles.—Bromides, Chlorides, and Iodides. Organic and readily oxidisable matter.

Foreign Pharmacopœias.—Official in U.S. Not in the others.

Tests.—The distinguishing tests for Silver Oxide are the ease with which it undergoes decomposition when mixed with readily oxidisable substances such as Creosote and Potassium Permanganate, such decomposition being accompanied with rapid disengagement of heat, and if in a confined space with explosive violence; the evolution of Oxygen when heated to dull redness leaving a residue of metallic Silver, which should, when dissolved in Nitric Acid, yield the tests distinctive of Silver given under that substance. It is officially required to indicate 100·0 p.c. of pure Silver Oxide as gravimetrically determined by solution in Nitric Acid and precipitation with Hydrochloric Acid; 1·237 grammes of Silver Chloride should be yielded by 1 gramme of Silver Oxide. The *U.S.P.* gravimetric test indicates 99·8 p.c. of pure Silver Oxide, which is equivalent to 92·9 p.c. of pure metallic Silver; determined as the residue left on igniting the Oxide in a porcelain crucible; 0·5 gramme should not leave less than 0·464 gramme. Silver Oxide is not official in the *P.G.*

The more generally occurring impurities are metallic Silver, Lead, Copper, and Iron, all of which are mentioned in *B.P.* The presence of metallic Silver is evidenced by the evolution of reddish fumes when the Oxide is dissolved in Nitric Acid. Lead and Copper are detected as described under Argenti Nitras. The *U.S.P.* includes a test for Carbonate and a limit of Chloride, requiring that the Oxide should dissolve without effervescence in Nitric Acid, and that when a weighed quantity of 0·2 of a gramme of the Oxide is dissolved in 1 c.c of Nitric Acid mixed with twice its volume of Water, and 10 c.c. of Ammonia Solution are added, the liquid diluted to 60 c.c. the addition of 1 c.c. of Nitric Acid to 10 c.c. of this dilution should not produce a cloudiness.

ARMORACIÆ RADIX.

HORSERADISH ROOT.

FR., RAIFORT; GER., MEERRETIG; ITAL., RAFANO RUSTICANO; SPAN., RABONO RUSTICANO.

The fresh Root from cultivated plants of *Cochlearia Armoracia*, L. Most active in the autumn and early spring before the leaves have appeared.

Medicinal Properties.—Sialagogue, stomachic, slightly diuretic, and diaphoretic. Used in atonic dyspepsia and as a condiment; also as a sudorific in chronic rheumatism. Externally as a rubefacient. The infusion is used as a **gargle**.

Official Preparation.—Spiritus Armoraciæ Compositus.

Not Official.—Infusum Armoraciæ Compositum, Sirop de Raifort Composé.

Foreign Pharmacopœias.—Official in Dutch; Fr., Port. (Rabao Rustico); Span. and Mex. Not in the others.

Descriptive Notes.—The root is imported from Belgium in barrels, that usually sold not being cultivated in this country. It is made up in bundles of about twenty roots. It is whitish or yellowish-white externally, about 8 to 12 inches (20 to 30 cm.) or more long, about an inch (2·5 cm.) in diameter, cylindrical, slightly enlarged and marked with leaf scars at the crown, odourless, until scraped or broken, when it gives off a pungent odour; the taste is very pungent. Aconite root has on rare occasions been mistaken for it, but the latter is conical, tapering much below, blackish-brown externally and not pungent. Horseradish root is usually sold in the fresh state, rarely in a dried condition.

Preparation.

SPIRITUS ARMORACIÆ COMPOSITUS. Compound Spirit of Horseradish.

Scraped Horseradish Root, 1 oz.; Dried Bitter-Orange Peel, 1 oz.; Nutmeg, 11 grains; Alcohol (90 p.c.), 5 fl. oz.; Distilled Water, 6 fl. oz. Mix and distil 8 fl. oz.

Dose.—1 to 2 fl. drm. = 3·6 to 7·1 c.c.

Foreign Pharmacopœias.—Not in the other Pharmacopœias. Port., compound Wine; Mex. (Alcoholato de coclearia); Span. (Alcohol de coclearia). They all differ widely from the above.

Not Official.

INFUSUM ARMORACIÆ COMPOSITUM.—Fresh Root, sliced, 1; Black Mustard Seed, 1; Compound Spirit of Horseradish, 1; boiling Distilled Water, 20. Macerate two hours; strain, and add the Spirit.

It is found in practice that a temperature of 150° to 180° F. makes the strongest infusion.

Dose.—1 to 2 fl. oz. = 28·4 to 56·8 c.c., as a warm stimulant.

SIROP DE RAIFORT COMPOSÉ (Antiscorbutic Syrup).—Cochlearia Leaves, 1000; Water-cress Leaves, 1000; Horseradish Root, 1000; Dried Leaves of Menyanthes Trifoliata, 100; Bitter-Orange Peel, 200; Ceylon Cinnamon, 50; White Wine, 4000; White Sugar, 5000; all by weight. Bruise the Water-cress and Cochlearia Leaves, cut up the Horseradish Root, the Leaves of Menyanthes Trifoliata and the Bitter-Orange Peel; break up the Cinnamon Bark. Macerate the whole in the White Wine for two days and distil on a water-bath. Collect 1000 of the aromatic liquor, and with it prepare a syrup in a closed vessel on the water-bath in the proportion of 100 grammes of Sugar for each 100 grammes of the liquor.—*Fr.*

ARNICÆ RHIZOMA.

ARNICA RHIZOME.

B.P.Syn.—Arnicæ Radix.

Fr., Racine d'Arnique; Ger., Arnikawurzel; Ital., Rhizoma di Arnica; Span., Rizoma de Arnica.

The dried Rhizome and Roots of *Arnica montana*, Linn.

Collected in the mountainous parts of Central and Southern Europe.

The dried flower-heads are official in the *Ind.* and *Col. Add.*

Medicinal Properties.—Stomachic and slightly stimulant, irritant to the stomach and bowels in large doses. The **tincture** is used externally for bruises and sprains, diluted with Water, but inflammation of the skin may be set up; equally good results have been produced by the application of Spirit and Water.

Official Preparation.—Tinctura Arnicæ.

Not Official.—Arnica Opodeldoc, Extractum Arnicæ Radicis Fluidum, Linimentum Arnicæ.

Antidotes.—Opium, Morphine.

Symptoms of poisoning by Arnica are violent vomiting, intense headache, diarrhœa, colic, feeble pulse.

Foreign Pharmacopœias.—Official in Austr., Ital. and Port., **root** and **flowers**; Hung., **root, leaves,** and **flowers**; Belg., Dan., Dutch, Fr., Ger., Jap., Norw., Russ., Swed., Swiss and U.S., **flowers**; Mex., **rhizome, leaves,** and **flowers**; Span., **rhizome** and **flowers.**

Descriptive Notes.—The rhizome as imported requires to be picked over before use, and freed from various foreign matters and vegetable fibres, which are almost always mixed with it. It is officially described as about 1 to 2 inches (2½ to 5 cm.) in length, ⅙ to ¼ inch (4 to 6 mm.) in diameter, cylindrical and curved, horizontal. It is often furnished with one or more terminal proliferations, giving it a jointed appearance, and with rather distant, wiry, unbranched, brittle roots, on the lower surface only, and is sometimes terminated at the crown by the hairy bases of the leaves. The taste is acrid and bitter, and the odour characteristic, recalling that of apples. The transverse fracture shows a greyish or dirty white centre, and resin ducts near the inner margin of the cortex. It is sometimes mixed with the rhizome of species of *Hieracium*, or of *Geum urbanum*, Linn. The former lacks the resin ducts and odour, and the latter has a clove odour, and astringent taste, and has roots all round the erect rhizome or rootstock.

In the *P.G.* and *U.S.P.* the flowers are official instead of the root, but these are liable to attacks by insects, and lose their volatile oil more quickly than the rhizome.

Preparation.

TINCTURA ARNICÆ. Tincture of Arnica.

1 of Arnica Rhizome in No. 40 powder, percolated with Alcohol (70 p.c.) to yield 20. (1 in 20)

Foreign Pharmacopœias.—Official in Fr. and U.S., 1 in 5; Belg., Dan., Dutch, Ger., Norw., Russ., Swed. and Swiss, 1 and 10, Port. 1 in 10, all from **flowers**; Port., 1 in 5, from the **root**; Ital., **root** 1, Alcohol (60 p.c.) 10; Austr., **root** 4, **flowers** 1, Alcohol (70 p.c.) 25; Hung., **root** 6, **leaves** 3, and **flowers** 1, dilute Alcohol (70 p.c.) 50; Mex., **dried leaves** 1 in 5; Span., **root** 1, **flowers** 1, Alcohol (70 p.c.) to 10; all are by weight except U.S.

Tests.—Tincture of Arnica has a specific gravity of 0·890 to 0·895; contains about 0·6 p.c. w/v of total solids and about 68 p.c. w/v of Absolute Alcohol.

TINCTURA ARNICÆ FLORUM.—Percolate 1 of Arnica flowers with Alcohol (45 p.c.) to make 10.

Official in the *Ind.* and *Col. Add.* for North American Colonies.

Not Official.

ARNICA OPODELDOC.—White Soap, 4; Alcohol (90 p.c.), 10; Tincture of Arnica, 5; Camphor, 1. Dissolve by heat, and strain.

This has been incorporated in the *B.P.C.* under the title **Linimentum Arnicæ.**

EXTRACTUM ARNICÆ RADICIS FLUIDUM.—1 in 1, made by percolation with a mixture of Alcohol 3, Water 1.—*U.S.P.* 1890.

This has been incorporated in the *B.P.C.*

Not Official.

ARSENII BROMIDI LIQUOR.

LIQUOR POTASSII ARSENIATIS ET BROMIDI (*U.S.N.F.*). CLEMENS' SOLUTION.

Arsenious Anhydride, 145 grains; Potassium Bicarbonate, 587 grains; Bromine, 235 grains; Water, *q.s.* Boil the Arsenic and Potassium Bicarbonate in 8 oz. of Water till dissolved; when cold add 16 oz. of Water, then the Bromine, and make up with Water to 32 fl. oz. Stir occasionally during a few hours, then filter.

This Liquor was originally described by Dr. Clemens as 'a chemical union of Arsenic and Bromine,' but as the action of Bromine on Arsenious Acid results in the formation of Arsenic Acid and Hydrobromic Acid, the above formula has been adjusted to yield these products as Potassium salts.

The solution contains Arsenic equal to 1 p.c. of Arsenious Anhydride.

Recommended in the treatment of diabetes.—*L.M.R.* '83, 86.

Dose.—1 to 5 minims = 0·06 to 0·3 c.c.

ARSENII IODIDUM.

ARSENIOUS IODIDE.

AsI_3, eq. 452·20.

Syn.—ARSENIC IODIDE.

Orange or orange-red coloured crystals, having a faint odour of Iodine, and which lose Iodine on exposure to air and light.

It should be kept in dark amber-coloured well-stoppered glass bottles in a cool place.

Solubility.—1 in 11 of Water; 1 in 42 of Alcohol (90 p.c.); 1 in 19 of Carbon Bisulphide.

It is gradually decomposed by boiling Water and by boiling Alcohol.

Medicinal Properties.—Has been used in obstinate cutaneous affections of syphilitic and tubercular origin.

Dose.—$\frac{1}{20}$ to $\frac{1}{5}$ grain = 0·0034 to 0·013 gramme.

Prescribing Notes.—*It is generally given as Donovan's Solution, or in a* pill *well triturated with Milk Sugar and massed with Glucose.*

Official Preparation.—Liquor Arsenii et Hydrargyri Iodidi.

Foreign Pharmacopœias.—Official in Jap., Mex. (Yoduro de Arsenico) and U.S. Not in the others.

Tests.—The distinguishing tests for Arsenious Iodide are that its aqueous solution shall, when acidulated with Hydrochloric Acid, yield on addition of Hydrogen Sulphide Solution a yellow precipitate soluble in Potassium or Sodium Hydroxide Solution, in Potassium Carbonate Solution or in Ammonium Carbonate Solution, being reprecipitated on the addition of Hydrochloric Acid; a cold porcelain vessel impinged upon the flame of the ignited gas produced by the interaction of Zinc, Hydrochloric Acid and a little of an aqueous solution of the salt, acquires a dark metallic looking stain readily dissolved by Chlorinated Soda Solution; Hydrogen Arsenide is evolved when a little of the solution is boiled with Zinc and Potassium or Sodium Hydroxide Solution, this gas yields a black stain to filter paper moistened with Silver Nitrate Solution, and a dark metallic stain on porcelain as above when ignited; Stannous Chloride Solution containing a large excess of Hydrochloric Acid yields a brown or brownish-black coloration when mixed with a little of an aqueous solution; an aqueous solution acidulated with Hydrochloric Acid yields a dark metallic looking deposit on Copper when boiled with that metal; the Copper when removed, dried between folds of bibulous paper, and heated in a clean, dry test-tube yields a sublimate of white characteristic octahedral crystals. The aqueous solution yields with Silver Nitrate Solution a curdy yellow precipitate insoluble in Nitric Acid, almost insoluble in Ammonia Solution, but soluble in Potassium Cyanide solution; with a small quantity of Chlorine Solution and Starch Mucilage it yields an intense blue coloration, disappearing on heating and reappearing as the liquid cools; when treated with Chlorine Solution and shaken with Carbon Bisulphide, the latter liquid assumes a fine violet coloration. No mention of a volumetric or gravimetric method of determination is made in the *B.P.*, but the *U.S.P.* requires it to contain not less than 16·3 p.c. of Arsenic as indicated by titration with Deci-normal Volumetric Iodine Solution by the method described in the small type below.

The more generally occurring impurities are free acid, either Arsenious or Hydriodic, and mineral matter. The neutrality of the aqueous solution to Litmus affords an indication of the former, the latter is revealed by a residue remaining after volatilisation.

Volatilisation.—When heated on a water-bath no loss in Iodine occurs, *U.S.P.*, but at a higher temperature it volatilises, *B.P.* and *U.S.P.* Violet vapours of Iodine being set free, *B.P.*

Volumetric Determination.—0·5 gramme of Arsenious Iodide and 2 grammes of Sodium Bicarbonate dissolved in 50 c.c. of Water require not less than 21·9 c.c. Tenth-normal V.S. of Iodine to impart a slight yellow tint to the solution, *U.S.P.*

Preparation.

LIQUOR ARSENII ET HYDRARGYRI IODIDI. SOLUTION OF ARSENIOUS AND MERCURIC IODIDES.

Arsenious Iodide, $87\frac{1}{2}$ grains; Mercuric Iodide, $87\frac{1}{2}$ grains; Distilled Water, *q.s.* to make 20 fl. oz. (1 of each in 100)

A yellowish, odourless liquid, with a disagreeable metallic taste, sp. gr. 1·015 to 1·018. It is also known as **Donovan's Solution.**

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

11 minims contain $\frac{1}{10}$ grain of each salt.

Incompatibles.—Acids, the salts of Morphine, or other Alkaloid, and Corrosive Sublimate.

Foreign Pharmacopœias.—Official in U.S., 1 in 100.

ASAFETIDA.

ASAFETIDA.

Fr., Asafœtida; Ger., Asant; Ital., Assafetida; Span., Asafetida.

A gum resin obtained by incision from the Root of *Ferula fœtida*, Regel, and probably other species.

Medicinal Properties.—Nervine stimulant, expectorant, laxative and carminative. Useful in cases of flatulence, in hysteric paroxysms; also in some forms of chronic bronchitis; very useful as an enema in the flatulent distension of typhoid or peritonitis, and in infantile convulsions.

As a successful preventive against abortion.—*M.A.* '93, 64; *B.M.J.E.* '95, i. 35.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Prescribing Notes.—*In* **pill** *massed with a little dilute Alcohol. They are best varnished, as silver leaf is affected by this drug. The* **Tincture** *may be prescribed with Aromatic Spirit of Ammonia, or with the Tinctures of Valerian and Hyoscyamus. When diluted with water to form a* **mixture,** *it requires the addition of Mucilage of Gum Acacia.*

Official Preparations.—Tinctura Asafetidæ. Used in the preparation of Pilula Aloes et Asafetidæ, Pilula Galbani Composita, and Spiritus Ammoniæ Fetidus.

Not Official.—Enema Asafœtida, Mistura Asafetida Composita, Pilulæ Asafœtida.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Descriptive Notes.—The Asafetida of commerce varies exceedingly in appearance and in purity. It may occur in whitish tears from ½ inch (12·5 mm.) in diameter, or in flattened tears up to 3 inches (75 mm.) or more in diameter, or in masses of agglomerated tears of various sizes, either whitish or brownish or reddish-brown according to age, and more or less agglutinated with darker gum resin and mixed with stones. More rarely balls of sand, about 4 cm. in diameter, made with the liquid gum resin are offered under the name of stony Asafetida. As it is very difficult to purify without loss of essential oil, it is very necessary that the purest drug obtainable should be selected for dispensing purposes. It is officially limited to the rounded or flattened tears, more or less agglutinated, which are dull yellow in colour and darken on keeping, and internally yellowish and translucent, or milky-white and opaque, the freshly exposed surfaces gradually assuming a pink colour, changing to red and finally to reddish-brown. The *U.S.P.* requirements are much the same. The *P.G.* gives *Ferula Narthex*, Boiss., also as a source of the drug. The gum resin of that species, however, never becomes red on keeping, and Aitchison ascertained that in Kashmir it is not collected. For the purpose of being powdered the *P.G.* directs that it should be dried over quicklime, and triturated at the lowest practicable temperature. The Asafetida in tears that enters into commerce does not invariably turn red on exposure. Even fine-looking specimens in the form of tears, sometimes contain half their weight of pebbles covered with a thin layer of Asafetida, and it is only from selected specimens, easily distinguished by their light weight, that a drug affording only 10 p.c. of ash can be obtained. Usually the tears met with in commerce yield only one-third of their weight of this quality. Indeed, in this as in other cases, where much impurity is present, a purified preparation extracted by Alcohol from the crude drug should be official for dispensing purposes.

Tests.—The distinguishing tests for Asafetida are that when triturated with Water it forms a milky-white emulsion, which assumes a yellowish coloration on the addition of a few drops of Ammonia Solution ; the addition of Nitric Acid diluted with an equal volume of Water to the freshly fractured surface produces a greenish coloration ; when strongly heated in a dry test-tube, cooled and treated with boiling Water it yields a liquid which, when largely diluted and made alkaline with Ammonia Solution, exhibits a blue fluorescence. This test is known as the umbelliferone test, and the remarks on the test appearing under Ammoniacum apply equally here. It is officially required to contain not less than 65 p.c. of matter soluble in Alcohol (90 p.c.), but only the best quality will yield this proportion. The *U.S.P.* and *P.G.* fix 50 p.c. as the limit of matter soluble in Alcohol (90 p.c.). The method adopted by the *P.G.* of weighing the insoluble residue is preferable to determining the amount dissolved, on account of the loss of volatile constituents during evaporation. The determination of the Acid, Ester and Saponification values affords useful indications of the purity, but no mention of them appears in the *B.P.* Commercial Asafetida has an Acid value of from 60 to 80 ; an Ester value of from 80 to 130 ; and a Saponification value of 120 to 185. A sample of fine selected tears examined in the author's laboratory, which yielded 3·1 p.c. of ash and contained 68·3 p.c. of matters soluble in Alcohol (90 p.c.), had an Acid value of 131·9 ; an Ester value of 119·3 ; and a Saponification value of 251·3. Another sample which contained 37·8 p.c. of ash, and 44·5 p.c. of matters soluble in Alcohol (90 p.c.), had an Acid value of 43·4 ; an Ester value of 127·4 ; and a Saponification value of 170·8.

The more generally occurring impurities are inferior varieties of Gum and mineral matter. The presence of the former is detected by the Alcohol-solubility, the latter by the ash. A lengthy controversy has taken place over the amount of ash permissible. An ash limit of 20 p.c. has been suggested (*Y.B.P.* '00, 405), and it has been stated (*C.D.* '99, ii. 983) that at that date it was practically impossible to obtain any considerable quantity which would satisfy the *B.P.* tests. On the other hand, it was stated (*C.D.* '99, ii. 1037) that provided a fair price were paid a sufficient supply of *B.P.* quality could readily be procured. The *B.P.* limit of not more than 10 p.c. is generally upheld. The *U.S.P.* and *P.G.* both state not more than 10 p.c. The *Dutch Pharmacopœia*, which in the Third Edition adopted a 20 p.c. limit, in the new Fourth Edition allows not more than 10 p.c.

Preparations.

PILULA ALOES ET ASAFETIDÆ, 1 in 4. *See* ALOES.

PILULA GALBANI COMPOSITA, about 1 in 3½. *See* GALBANUM.

SPIRITUS AMMONIÆ FETIDUS, about 33 grains in 1 oz. *See* AMMONIA.

TINCTURA ASAFETIDÆ. TINCTURE OF ASAFETIDA.

1 of Asafetida, macerated with Alcohol (70 p.c.), to yield 5. (1 in 5)

Dose—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Belg. (1 and 4½), Dan., Dutch, Fr., Ital., Jap., Norw., Port., Span., Mex., Swed. and Swiss, 1 and 5; U.S., 1 in 5; all by weight, except U.S.; not in Austr., Ger., Hung. or Russ.

Tests.—Tincture of Asafetida has a specific gravity of about 0·912. It contains about 9½ p.c. w/v of total solids and about 60 p.c. w/v of Absolute Alcohol.

Not Official.

ENEMA ASAFŒTIDA.—Asafetida, 30 grains; Distilled Water, 4 fl. oz. Rub the Asafetida in a mortar with the Water added gradually so as to form an emulsion.—*B.P.* 1885.

Tincture of Asafœtida, 1 fl. drm.; Mucilage of Starch, 4 fl. oz.—*St. Thomas's*.

This has been incorporated in the *B.P.C.* as follows:—

Tincture of Asafœtida, 3; Mucilage of Starch, *q.s.* to make 100.

MISTURA ASAFETIDA COMPOSITA.—Asafetida, picked, 5 grains; Liquid Extract of Cascara Sagrada, 10 minims; Ammonium Carbonate, 4 grains; Infusion of Valerian (1 in 40), to 1 fl. oz. The Ammonia in this mixture develops the taste and odour of the other constituents.—*St. Thomas's*.

This has been incorporated in the *B.P.C.*, using 5 grains of Ammonium Carbonate in place of 4.

PILULÆ ASAFŒTIDA.—Asafetida, 20 grammes; Soap, in fine powder, 6 grammes; Water, *q.s.* to make 100 pills.—*U.S.P.* Each pill contains 3 grains of Asafetida.

This has been incorporated in the *B.P.C.*

ATROPINA.

ATROPINE.

$C_{17}H_{23}NO_3$, eq. 287·05.

FR., ATROPINE; GER., ATROPIN; ITAL., ATROPINA; SPAN., ATROPINA.

Colourless, odourless acicular crystals, or as a white more or less amorphous powder. Taste bitter and acrid. Obtained from the leaves and root of Belladonna. It gradually assumes a yellowish tint on exposure to air, and should be kept in well-stoppered dark amber-tinted bottles.

It is officially regarded as an alkaloid, obtained from Belladonna Leaves or Root. The bulk of the alkaloid existing in Belladonna is Hyoscyamine, which is isomeric with Atropine; and the former has a constant tendency to change into the latter.

Atropine (uncombined with an Acid) easily decomposes when heated. A solution of 1 in 200 of Water heated in a basin or on a water-bath for two hours was so completely decomposed that it lost its alkaline reaction and ceased to precipitate with Mercuric Chloride Solution, after eight hours the reaction was faintly acid.

Solubility.—1 in 500 of Water; 1 in 3 of Alcohol (90 p.c.); 1 in 25 of Ether; 1 in 1 of Chloroform; 1 in 52 of Glycerin; 1 in 15 of Oleic Acid.

Medicinal Properties.—The **Ointment** is used for the relief of pain arising from muscular spasm, and for neuralgia. *See* also Atropinæ Sulphas and Belladonna.

Dose.—$\frac{1}{200}$ to $\frac{1}{100}$ grain = 0·0003 to 0·0006 gramme.

It is freely soluble in Oleic Acid, and is sometimes applied as a 1 or 2 p.c. solution.

Official Preparation.—Unguentum Atropinæ.

Not Official.—Atropinæ Oleas, Unguentum Atropinæ, Unguentum Atropinæ Dilutum, Unguentum Atropinæ cum Acido Borico, Unguentum Atropinæ cum Cocaina, and Atropinæ Oleas.

Antidotes.—In case of poisoning by Atropine, the antidotes are the same as for Belladonna.

Foreign Pharmacopœias.—Official in Fr., Mex., Port., Span. and U.S. Not in the others.

Tests.—The distinguishing tests for Atropine are the melting point which, when pure, should be about 115·5° C. (248° F.); the Aurichloride, which should be dull and pulverulent in physical appearance, should possess a melting point of 137° C. (278·6° F.); the strongly marked mydriatic action when a drop of a very dilute solution is carefully instilled into the eye; the optical inactivity; the purple-violet coloration produced when a crystal is evaporated to dryness with fuming Nitric Acid, and the residue is moistened with a freshly prepared alcoholic Potassium Hydroxide solution, this test being known as Vitali's test; the yellow precipitate changing to red, which occurs when an alcoholic solution is warmed with Mercuric Chloride Solution; the alkaline reaction to Litmus and Phenolphthalein, which distinguishes Atropine and its isomers from almost all other known alkaloids. The *B.P.* mentions most of these tests, but not the optical inactivity or melting point of the Aurichloride, although it describes the method of producing the salt and its physical appearance and includes a melting point for Hyoscine Aurichloride. The *U.S.P.* states that pure Atropine Aurichloride melts at 136° C. (276·8° F.). The colour reaction with Vitali's test is very delicate, and although other alkaloids, Pseudaconitine, Veratrine, and Strychnine, afford colours somewhat resembling this, there is no difficulty in detecting Atropine in the pure state when unmixed with other alkaloids. The *U.S.P.* states that the presence of Strychnine masks this reaction. The latter Pharmacopœia also states that it produces no precipitate with Platinic Chloride Solution and that it yields a pink coloration not dissipated by 0·5 gramme of Chloral Hydrate, when a crystal is treated with Sulphuric Acid containing a drop of Cresol, which distinguishes it from most other alkaloids. It is also stated to give a peculiar odour indicative of a mixture of Rose, Orange flower, and Melilot when heated with a little Sulphuric Acid, the odour changing to one of Bitter Almonds on the addition of a small crystal or two of Potassium Bichromate.

Atropine may be readily titrated with Deci- or Centi-normal Volumetric Hydrochloric or Sulphuric Acid Solution, using Cochineal Solution as an indicator. 1 c.c. Deci-normal solution = 0·0287 gramme of Atropine, and 1 c.c. of Centi-normal solution = 0·00287 gramme of Atropine. Atropine is not official in the *P.G.*

The more generally occurring impurities are mydriatic alkaloids other than Atropine, *e.g.*, Hyoscyamine and Scopolamine; Morphine, and mineral matter.

Hyoscyamine and Scopolamine are readily detected by their optical activity; Morphine, if present, by the red coloration produced when a small quantity of the alkaloid is treated with a mixture of Sulphuric and Nitric Acids; mineral matter by the amount of residue left on ignition, which should be nil.

Gold Chloride.—The Chloraurate may be made by adding Gold Chloride T.S. to a solution of Atropine in dilute Hydrochloric Acid, washing, collecting, and drying the precipitate, which should be yellow and lustreless, *U.S.P.*

Vitali's Test.—If Atropine be moistened with Nitric Acid (fuming, *B.P.*), and heated in a porcelain dish on a water-bath to dryness, the residue (which is yellow, *U.S.P.*) gives with alcoholic Potassium Hydroxide solution a fugitive reddish-violet coloration, *B.P.*, an intense violet coloration, *U.S.P.* The *B.P.* directs freshly prepared alcoholic Potassium Hydroxide solution, and the *U.S.P.* directs the addition of a fragment of Potassium Hydroxide as well as the alcoholic solution. Hyoscyamine and Hyoscine will produce the same colour, but the presence of Strychnine will mask the reaction, *U.S.P.*

Sulphuric Acid.—Sulphuric Acid when added to Atropine should produce no colour (absence of readily carbonisable organic impurities), nor should the subsequent addition of Nitric Acid yield any colour (absence of and difference from Morphine), *U.S.P.*

Preparation.

UNGUENTUM ATROPINÆ.—ATROPINE OINTMENT.

Atropine, 2; Oleic Acid (by weight), 8; Lard, 90. (1 in 50)

Not Official.

UNGUENTUM ATROPINÆ.—Atropine, 4 grains; Soft Paraffin, 1 oz.; heat till dissolved, and stir till cold.—*London Ophthalmic*; *Middlesex*, same strength with Vaseline.

UNGUENTUM ATROPINÆ DILUTUM.—Atropine 1 p.c., in fine powder, incorporated in Yellow Soft Paraffin of uniform consistence having a melting point of about 35° C.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

UNGUENTUM ATROPINÆ CUM ACIDO BORICO.—Atropine, 4 grains; Powdered Boric Acid, 60 grains; Soft Paraffin, 1 oz.—*London Ophthalmic.*

UNGUENTUM ATROPINÆ CUM COCAINA.—Atropine, 4 grains; Cocaine, 8 grains; Soft Paraffin, 1 oz.; heat till the alkaloids are dissolved.—*London Ophthalmic.*

Atropine, 1 p.c.; Cocaine, 2 p.c.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

ATROPINÆ OLEAS.—Atropine, 8 grains; Oleic Acid, 1 oz.

OLEATUM ATROPINÆ.—Atropine, 2; Alcohol (95 p.c.), 2; Oleic Acid, by weight, 50; Olive Oil, *q.s.* to make 100 by weight. Triturate the Atropine in a tared mortar with the Alcohol, then add an equal volume of the Oleic Acid and, after warming the mortar, stir until the Alcohol has evaporated, add the remainder of the Oleic Acid and continue stirring until the Atropine is dissolved, then add Olive Oil to make 100 by weight.—*U.S.P.*

This has been incorporated in the *B.P.C.* with the title **Oleinatum Atropinæ.** *Syn.* OLEATUM ATROPINÆ.

HOMATROPINE.—*See* p. 598.

ATROPINÆ SULPHAS.

ATROPINE SULPHATE.

FR., SULFATE D'ATROPINE; GER., ATROPINSULFAT; ITAL., SOLFATO DI ATROPINA; SPAN., SULFATO DE ATROPINA.

$(C_{17}H_{23}NO_3)_2H_2SO_4$, eq. 671·44.

A white, or almost white, odourless, more or less crystalline powder, having a bitter, nauseous taste.

It is the Sulphate of an alkaloid obtained from Belladonna Leaves or Root and may be obtained by neutralising Atropine with Diluted Sulphuric Acid. As obtained commercially it almost invariably contains a small proportion of Hyoscyamine Sulphate.

Solubility.—10 in 4 of Water; 1 in 4 of Alcohol (90 p.c.). Insoluble in Ether and Chloroform.

Medicinal Properties.—Mydriatic, anhidrotic, antigalactagogue. Employed locally to dilate the pupil and paralyse the accommodation, in iritis, and before testing refraction or making ophthalmoscopic examination; used also to cause retraction of protruding iris; as it increases intraocular tension it does harm in glaucoma. It is frequently combined with Morphine in hypodermic administration to prevent the undesirable effects of the latter. Injected as near the nerve as possible in sciatica, hypodermically in ovarian and uterine pain. The hypodermic method is also the best to diminish the sweating of phthisis, for which purpose, in doses of $\frac{1}{200}$ to $\frac{1}{100}$ grain, Atropine is very useful; it at the same time relieves the cough; or 1 or 2 minims of the Liquor Atropinæ Sulphatis may be given by the mouth.

Hypodermically also in spasmodic asthma, in narcotic poisoning, in aiding the reduction of hernia, and, with Strychnine, in lessening the craving for Alcohol. *See* also Atropine and Belladonna.

In morphinism.—*B.M.J.E.* '94, i. 20.

In hernia, the hypodermic injection of $\frac{1}{70}$ grain of Atropine was followed by immediate spontaneous reduction. In four subsequent cases $\frac{1}{70}$ to $\frac{1}{45}$ grain were used. In another case, a second injection necessary, and in a sixth case three injections.—*B.M.J.E.* '02, ii. 92.

In intestinal obstruction, three injections of $\frac{1}{66}$ grain each.—*B.M.J.E.* '01, ii. 48; *M.A.* '02, 362.

In asthma, $\frac{1}{2}$ milligramme internally, increasing dose every second or third day by $\frac{1}{2}$ milligramme until patient is taking 4 milligrammes a day, gradually diminishing doses after a time. Duration of treatment, four to six weeks. Second and third course recommended at interval of six months.—*Pr.* lxii. 698.

In broncho-pneumonia in children.—*Pr.* lxii. 698.

Warning against the indiscriminate use of Atropine in eye diseases, particularly with patients over thirty years of age.—*B.M.J.* '02, i. 267.

In *B.M.J.* '05, i. 132, and '07, ii. 951 are the details of the treatment for inebriety.

Diabetes successfully treated.—*B.M.J.E.* '07, ii. 28.

Morphinomania successfully treated by Atropine and Strychnine. *B.M.J.* '07, i. 1173.

In the treatment of infantile syphilitic iritis (*Pr.* lxxv. 563), the local use of a solution of 2 grains of Atropine Sulphate to the oz. of Distilled Water, together with the inunction of mercurial ointment, is recommended.

2 or 3 drops of a 4 grains to the oz. solution instilled into the eye daily, or where the patient objected one eye was merely bandaged, thus altering the principal focus, the motion of objects is not so uniformly transmitted to the brain and tendency to sea-sickness is diminished.—*B.M.J.* '05, i. 1090.

In the treatment of inebriety (*B.M.J.* '05, ii. 1691) the hypodermic injection of Atropine combined with Strychnine has proved of great value in relieving the intensity of the appetite, and when thoroughly pushed it confers indifference to Alcohol. $\frac{1}{100}$ grain Atropine increased to $\frac{1}{80}$ grain with $\frac{1}{100}$ grain Strychnine; also, the injection of 1 minim of Liquor Atropinæ Sulphatis, with 4 minims of Liquor Strychninæ Hydrochloridi, twice daily for a month, then once daily for a fortnight, then every second day for a month.—*B.M.J.* '06, i. 515.

Drops of Atropine Sulphate, 1 grain; Cocaine Hydrochloride, 4 grains; Adrenalin solution (1 in 1000), 30 minims; Water, 2½ drm.; applied 1 drop in the eye every 3 hours in acute conjunctivitis.—*M.P.* '05, ii. 303.

Two cases of toxic symptoms following the application of Atropine drops to the eyes of children. In one case drops containing 2 grains and in the other 4 grains of Atropine to the oz. were used.—*L.* '05, ii. 964.

Dose.—$\frac{1}{200}$ to $\frac{1}{100}$ grain = 0·0003 to 0·0006 gramme.

Dan., Dutch, Fr., Ger., Ital., Norw., Russ. and Swiss give the maximum single dose as 0·001 gramme; Ger., Ital. and Russ., maximum daily dose 0·003 gramme; Fr., 0·002 gramme.

Prescribing Notes.—*The Sulphate is best adapted for Aqueous Solutions, and the pure Alkaloid for Ointments. Can be given in pill well triturated with Milk Sugar and massed with 'Diluted Glucose.' Generally given in solution.*

Official Preparations.—Lamellæ Atropinæ, and Liquor Atropinæ Sulphatis.

Not Official.—Glycerinum Atropinæ, Guttæ Atropinæ Sulphatis, Guttæ Atropinæ cum Cocaina, Injectio Atropinæ Hypodermica, Linimentum Atropinæ, Linimentum Atropinæ et Chloroformi, Pilulæ Atropinæ et Morphinæ, Pessus Atropinæ, Pilula Atropinæ, Atropinæ Methylbromidum, Atropinæ Salicylas, Atropinæ Valerianas, Euphthalminæ Hydrochloridum, Guttæ Euphthalminæ Hydrochloridi, Lamellæ Euphthalminæ.

Atropine is used as an antidote in poisoning by Physostigmine, Morphine, Aconite, Gelsemine, Hydrocyanic Acid, Muscarine, Nitroglycerin, and Pilocarpine.

Antidotes.—In case of poisoning by Atropine, the antidotes are the same as for Belladonna, *q.v.*

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—The distinguishing tests for Atropine Sulphate are the melting point, which should be 189° C. (347·2° F.); the mydriatic action produced even by highly diluted solutions of the salt; the production of a purple-violet coloration when a small quantity is moistened with Nitric Acid evaporated on a water-bath and the residue treated with an Alcoholic Potassium Hydroxide Solution; the production of a white precipitate, on the addition of Sodium Carbonate to a saturated aqueous solution, and when this precipitate is collected it should answer the tests described under Atropine. The aqueous solution yields on acidification with diluted Hydrochloric Acid and addition of Barium Chloride Solution, a white precipitate insoluble in Hydrochloric Acid.

The melting point given in the *B.P.* and *P.G.* is open to criticism (*P.J.* '98, ii. 195). Will gives 196° C. (384·8° F.); *U.S.P.* about 189·9° C. (373·5° F.), and when free from Hyoscyamine about 188° C. (370·4° F.); Hesse, 180° to 181° C. (356° to 357·8° F.); Merck, 189° to 191° C. (372·2° to 375·8° F.); whilst a salt prepared by Jowett from pure Atropine melted at 190° C. (374° F.). 3 c.c. of a 1 in 60 aqueous solution mixed with 1 c.c. of Sodium Hydroxide Solution (15 p.c.) yields a precipitate, but a solution of the same strength is unaffected by a corresponding amount of Ammonia Solution. A pleasant aromatic odour is evolved when a small quantity of the salt, which has been heated until white fumes are disengaged, is warmed with Sulphuric Acid until it commences to turn brown, and then a small quantity of Water is carefully added, the addition of a few crystals of Potassium Permanganate produces an odour of Essential Oil of Bitter Almonds.

The more generally occurring impurities are Sulphates of mydriatic alkaloids other than Atropine, *e.g.*, Hyoscyamine and Scopolamine, readily oxidisable organic impurities, Morphine and mineral matter. Hyoscyamine and Scopolamine Sulphates are indicated by their optical activity; organic impurities by the colour imparted to a solution of the salt in concentrated Sulphuric Acid; Morphine by the red coloration produced on the addition of Sulphuric Acid followed by Nitric Acid to a little of the salt, and mineral matter by the ash left on ignition which should be nil. Atropine Sulphate contains 85·5 p.c. of Atropine and 14·5 p.c. of Sulphuric Acid.

Sulphuric Acid.—If 1·5 c.c. Sulphuric Acid be added to 0·01 gramme of Atropine Sulphate which has been heated in a test-tube until the evolution of white vapours occurs, and then warmed until the mixture begins to turn brown, then on immediately and carefully adding Water to this, a pleasant characteristic aromatic odour comes off. After the addition of a crystal of Potassium Permanganate the liquid smells of Essential Oil of Almond, *P.G.* *See* also *U.S.P.*, under Atropine.

Vitali's Test.—0·01 gramme Atropine Sulphate heated to dryness in a porcelain dish on a water-bath with 5 drops fuming Nitric Acid, leaves a faintly yellow residue, which on pouring over it an Alcoholic Solution of Potassium Hydroxide, and warming, assumes a violet colour, *P.G.*

Preparations.

LAMELLÆ ATROPINÆ. DISCS OF ATROPINE.

Discs of Gelatin, each weighing about $\frac{1}{50}$ grain (1·3 milligrammes) and containing $\frac{1}{5000}$ grain (0·013 milligramme) of Atropine Sulphate.

Gelatin Discs, each containing 0·001 gramme Atropine Sulphate, are official in Swed. Ital. contains $\frac{1}{10}$ milligramme.

LIQUOR ATROPINÆ SULPHATIS. SOLUTION OF ATROPINE SULPHATE.

Atropine Sulphate, 1; Salicylic Acid, $\frac{1}{8}$; Distilled Water, 100.
(1 in 100)

Dose. $\frac{1}{2}$ to 1 minim = $\frac{1}{220}$ to $\frac{1}{110}$ grain of Atropine Sulphate.

Foreign Pharmacopœias.—Official in Port., 1 in 100. Not in the others.

Not Official.

GLYCERINUM ATROPINÆ.—Atropine Sulphate, 25½ grains, dissolved in Water, 5 fl. oz.; add Compound Tincture of Lavender, 100 minims, and Glycerin, to 20 fl. oz. 100 c.c. contains 0·25 gramme Atropine.—*St. Thomas's.*

Atropine Sulphate, 1¼ grains; Water, 2 drm.; Compound Tincture of Lavender, 5 minims; Glycerin, to 1 oz.—*University.*

Atropine Sulphate, 0·25; Distilled Water, 25; Compound Tincture of Lavender, 1; Glycerin, *q.s.* to produce 100.—*B.P.C.*

GUTTÆ ATROPINÆ SULPHATIS.—Atropine Sulphate, 1, 2 or 4 grains; Distilled Water, 1 oz.—*London Ophthalmic.*

GUTTÆ ATROPINÆ CUM COCAINA.—Atropine Sulphate, 2 grains; Cocaine Hydrochloride, 10 grains; Distilled Water, 1 oz.—*London Ophthalmic.*

INJECTIO ATROPINÆ HYPODERMICA.—Atropine Sulphate, 2 grains; Water, 1 oz.

Dose.—2 to 4 minims = $\frac{1}{120}$ to $\frac{1}{60}$ grain of Atropine Sulphate.

B.P.C. Injection contains 0·12 p.c.

INJECTIO ATROPINÆ ET MORPHINÆ HYPODERMICA. *See* MORPHINÆ ACETAS.

LINIMENTUM ATROPINÆ.—Atropine Sulphate, 38¼ grains; Compound Tincture of Lavender, 100 minims; Alcohol (90 p.c.), to 20 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.* as follows:—

Atropine Sulphate, 0·40; Compound Tincture of Lavender, 1; Alcohol, *q.s.* to produce 100.

LINIMENTUM ATROPINÆ ET CHLOROFORMI. — Atropine Liniment, 5; Chloroform, 1.—*St. Thomas's.*

This has been modified in the *B.P.C.* as follows:—

Chloroform, 12·50; Atropine Liniment, *q.s.* to make 100.

PILULA ATROPINÆ.—Atropine Sulphate, $\frac{1}{60}$, $\frac{1}{80}$, $\frac{1}{100}$, $\frac{1}{120}$ grain; Liquorice Powder, 2 grains; Tragacanth Powder, 1 grain; Mucilage of Acacia, *q.s.*—*Brompton.*

PILULA ATROPINÆ ET MORPHINÆ.—Atropine Sulphate, $\frac{1}{100}$ grain; Morphine Hydrochloride, $\frac{1}{6}$ grain; Milk Sugar, 1 grain.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

PESSUS ATROPINÆ.—Atropine, $\frac{1}{20}$ grain; Conine, 1 minim; Oil of Theobroma, to 120 grains.—*Samaritan.*

ATROPINÆ METHYLBROMIDUM (Mydriasine).—A white crystalline powder, readily soluble 1 in 1 of Water, soluble 1 in 10 of Alcohol (90 p.c.), insoluble in Ether. Employed in the form of a 1 to 2 p.c. solution either plain, or as a solution containing 1 p.c. of Cocaine. A valuable succedaneum for Atropine Sulphate. Free from its disadvantages and possessing its advantages. Invaluable in determining static refraction or in any ophthalmoscopic examination, where dilatation of the pupil is indispensable. In large quantities (1 to 2 p.c. solution) it has the same action on the pupil and accommodation as Atropine Sulphate. In moderate quantities (1 drop of 1 p.c. solution) the mydriasis produced may last about twenty-four hours, but the paralysis of accommodation disappears in a few hours. In small quantities (1 drop 0·5 p.c. solution containing 1 p.c. of Cocaine), considerable dilatation of the pupil results with scarcely any appreciable paresis of accommodation. Atropine Methylbromide is thus a valuable diagnostic agent in the beginning of iritis, but should there be no iritis, the inconvenience produced is less than if Atropine had been instilled. One drop of a 1 p.c. solution produces a maximum dilatation of the pupil in from 30 to 45 minutes. Cocaine intensifies the dilatation; Eserine quickly diminishes the pupillary dilatation produced by Methylbromide.—

B.M.J.E. '03, ii. 52. Has been used in doses of $\frac{1}{10}$ to $\frac{1}{5}$ of a grain = 0·0065 to 0·013 gramme in pill form in the treatment of the night sweats of phthisis. In addition to its mydriatic effect it has a distinct sedative and analgesic effect (*B.M.J.E.* '06, i. 72); for ophthalmic purposes it may be used in strengths from $\frac{1}{4}$ to 5 p.c. A useful average strength is 1·0 p.c.

Tests.—Atropine Methylbromide has a melting point of 222° to 223° C. (431·6° to 433·4° F.); its aqueous solution yields a whitish precipitate with Mayer's reagent, the residue remaining after evaporating a small quantity of the salt with a few drops of concentrated Nitric Acid yields a purple-violet coloration when treated with Alcoholic Potassium Hydroxide Solution; its aqueous solution yields a white curdy precipitate with Silver Nitrate solution and a yellow coloration with Chlorine Water, the latter when shaken with Chloroform yielding a yellowish-brown solution. It should leave no residue when ignited with free access of air.

ATROPINÆ SALICYLAS, $C_{17}H_{23}NO_3.C_7H_6O_3$, eq. 424·06.—A white crystalline powder, only slightly soluble in Water. Introduced as a substitute for the Sulphate in ophthalmic practice, but its aqueous solution does not keep so well as that of the latter. The author prepared 1 p.c. solutions of each salt, and the Salicylate developed a growth more quickly than the Sulphate. To make the solution keep well an excess of Salicylic Acid is required, and then it is irritating to the eye.

Tests.—The aqueous solution yields with Mayer's reagent a whitish precipitate; a crystal evaporated on a water-bath with concentrated Nitric Acid leaves a residue which when moistened with a few drops of Alcoholic Potassium Hydroxide Solution yields a purplish-violet coloration. The diluted aqueous solution yields with Ferric Chloride Test-solution a deep violet coloration. It should leave no residue when ignited with free access of air.

It should contain 67·7 p.c. of Atropine and 32·3 p.c. of Salicylic Acid.

Liquor Atropinæ Salicylatis.—Atropine, 5 grains; Salicylic Acid, 7½ grains; Water, 10 oz.—*Charing Cross.*

ATROPINÆ VALERIANAS, $C_{17}H_{23}NO_3.C_5H_{10}O_2.H_2O$, eq. 406·24.—Colourless, or white hygroscopic rhomboid crystals, having an odour of Valerianic Acid, and becoming coloured on exposure to light. Readily soluble in Water and in Alcohol (90 p.c.). Antispasmodic, antineuralgic. Recommended for internal administration.

Dose.—$\frac{1}{65}$ grain = 0·001 gramme. **Official in** Mex. and Port.

Tests.—The salt softens at 20° C. (68° F.), and melts at 32° C. (89·6° F.). The aqueous solution when acidified with a mineral acid throws out an oily fluid which collects on the surface of the liquid; Sodium or Potassium Hydroxide Solution produces a white precipitate. A crystal with a few drops of concentrated Nitric Acid evaporated to dryness yields a residue which assumes a purplish-violet coloration when moistened with a few drops of Alcoholic Potassium Hydroxide Solution. When ignited with free access of air it should leave no residue. The crystallised salt should contain 70·6 p.c. of Atropine and 24·9 p.c. of Valerianic Acid.

EUPHTHALMINÆ HYDROCHLORIDUM (Phenylglycoyl-*n*-methyl-β-vinyl-diacetone-alkamine hydrochloride).—White crystalline powder. Readily soluble in Water. Mydriatic. Introduced as a substitute for Atropine and Homatropine, and used as a 2 to 5 p.c. solution. Stated to weaken the accommodation only to a very slight extent, but has no appreciable effect on the conjunctival vessels or on the corneal epithelium, and causes no hyperæmia, and effects soon pass off.—*B.M.J.* '99, ii. 775; *L.* '99, ii. 458; *Pr.* lxiv. 476. The free base **Euphthalmine** crystallises in six-sided prisms. A readily soluble **Euphthalmine Salicylate** has also been prepared.

Guttæ Euphthalminæ Hydrochloridi.—Euphthalmine Hydrochloride, 10 grains; Distilled Water, 1 oz.—*London Ophthalmic.*

Lamellæ Euphthalminæ.—Each disc contains $\frac{1}{50}$ grain Euphthalmine.—*London Ophthalmic.*

AURANTII CORTEX.

Fr., Bigaradier; Ger., Pomeranzenschale; Ital., Arancio Amaro; Span., Naranja Amara.

Both the fresh and the dried outer part of the Pericarp of *Citrus Aurantium*, var. *Bigaradia*, are official.

In India and the Eastern Colonies, Aurantii Cortex Indicum (*Ind.* and *Col. Add.*) may be used. It is the corresponding portions of the varieties of *Citrus Aurantium* grown in India and Ceylon.

Medicinal Properties.—Carminative and bitter stomachic. The Tincture and Syrup are largely used as flavouring agents.

Prescribing Notes.—*Preparations of Orange Peel should not be prescribed with Tincture of Perchloride of Iron, as the mixture would be blackened.*

Official Preparations.—Of the **Fresh Peel,** Tinctura Aurantii and Vinum Aurantii. Of the **Tincture,** Syrupus Aurantii, contained in Tinctura Quininæ, Syrupus Aromaticus and Syrupus Cascaræ Aromaticus. Of the **Dried Peel,** Infusum Aurantii and Infusum Aurantii Compositum; used in the preparation of Infusum Gentianæ Compositum, Spiritus Armoraciæ Compositus, Tinctura Cinchonæ Composita, and Tinctura Gentianæ Composita.

Not Official.—Oleum Aurantii Corticis, Elixir Aurantii, Elixir Aromaticum, Elixir Simplex, Infusum Aurantii Concentratum, Infusum Aurantii Compositum Concentratum, Spiritus Aurantii Compositus, Vinum Aurantii Detannatum.

AURANTII CORTEX RECENS. Fresh Bitter-Orange Peel.

The Fresh outer part of the Pericarp of *Citrus Aurantium*, var. *Bigaradia*, Hook. f.

Foreign Pharmacopœias.—Official in Belg., Fr., Mex., Port. and Span.; U.S., *Citrus Aurantium.* The following use the unripe fruit: Ger., Jap., Norw., Russ., Swed. and U.S.

Descriptive Notes.—The fresh rind of the Seville or bitter orange *Citrus Aurantium*, L., var. *Bigaradia*, Hook. f., is official. It is characterised by its reddish or deep orange red colour and its rough glandular surface. It should retain but little of the white spongy portion. The taste is bitter and aromatic. It is most easily purchased in the fresh state in February and March, when it usually arrives in this country.

Preparations.

SYRUPUS AROMATICUS. Aromatic Syrup.

Tincture of Orange, 1; Cinnamon Water, 1; Syrup, 2. The turbid fluid, formed by mixing the Tincture and Cinnamon Water, is cleared by filtration through Talc, before the Syrup is added.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

SYRUPUS AURANTII. Syrup of Orange.

Tincture of Orange, 1; Syrup, 7. (1 in 8)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Hung., Peel, weak Spirit, Sugar, and Tincture; Belg., Fluid Extract 1, Syrup 19; Dutch, Peel, Water, and Sugar;

Dan., Fr., Ital. and Swed., Peel, Spirit, Water, and Sugar; Austr., Ger., Russ. and Swiss, Peel, Wine, and Sugar; Jap., Tincture of Bitter-Orange Peel 3, Syrup 17; Norw., Tincture 1, Syrup 9; Mex., Alcoholatura 1, Syrup 9; Port., Peel, Boiling Water and Sugar; Span. (Jarabe de Corteza de Naranja), Water of Orange Peel and Sugar; (Jarabe de Corteza de Naranja Amarga), Wine of Bitter-Orange Peel and Sugar. All by weight, except U.S.

Syrupus Aurantii (*U.S.*)—Tincture of Sweet Orange 5; is triturated with Magnesium Carbonate 1, and Water 40, gradually added, filtered, sufficient Water added to produce 45, Citric Acid 0·5 dissolved in the filtrate, then Sugar 82, and sufficient Water added to produce 100 by volume.

TINCTURA AURANTII. Tincture of Orange.

Macerate 1 of Fresh Bitter-Orange Peel, cut small, with 4 of Alcohol (90 p.c.). (1 in 4)

Formerly called Tinctura Aurantii Recentis, and 6 of Fresh Peel made 20 of Tincture.

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Belg., Fresh Peel 1, Alcohol (60 p.c.) 5; Dutch, Peel 1, Alcohol (70 p.c.) 5; Fr. (Alcoolature d'Orange), Fresh Peel 1, Alcohol 2; Ital., Peel 1, Alcohol 2; both by weight. U.S. (Tinctura Aurantii Dulcis), from Fresh Peel, 1 in 5; not in the others. The following are made with Dried Peel: Austr., Dan., Dutch, Fr., Ger., Hung., Jap., Norw., Russ., Swed., Swiss and U.S., 1 and 5; all by weight, except U.S. Not in Port.

Tests.—Tincture of Orange has a sp. gr. of about 0·880, contains about 2 p.c. w/v of total solids and about 74 p.c. w/v of Absolute Alcohol.

VINUM AURANTII. Orange Wine.

A sherry-coloured weak alcoholic liquid, prepared by the fermentation of a saccharine solution containing Fresh Bitter-Orange Peel.

Foreign Pharmacopœias.—Official in Span., Dried Bitter-Orange Peel 1, Carinena or Alicante Wine 20. Belg. and Swiss have a compound wine, but they vary considerably in composition.

The Orange Wine of commerce.

Tests.—Orange Wine has a sp. gr. of about 1·030, it contains about 11·5 p.c. of total solids. It is officially required to contain 10 to 12 p.c. w/v of Ethyl Hydroxide. Good commercial samples contain from 15 to 18 p.c. w/v of Absolute Alcohol. In testing for Salicylic Acid 1 fl. oz. of the Wine is rendered alkaline by the addition of Sodium Hydroxide Solution, and shaken with Ether, the ethereal solution separated and rejected, the Wine may then be rendered acid with diluted Sulphuric Acid and again shaken with Ether, the ethereal solution separated, carefully washed with Water till free from mineral acid and shaken with Water to which a drop or two of Ferric Chloride T.S. has been added; Salicylic Acid, if present, is indicated by the violet coloration produced. The *B.P.* performs the test for Salicylic Acid on the distillate obtained from a mixture of 50 c.c. of Wine, 50 c.c. of Water and 5 c.c. of Normal Volumetric Sulphuric Acid Solution, rejecting the first 10 c.c. distilled and shaking the balance with Ether. Ferric Chloride T.S. is used as a reagent, and the test is carried out on the residue left on evaporation.

Not Official.

INFUSUM AURANTII CONCENTRATUM. Dried Bitter-Orange Peel, in No. 10 powder, 40; Tincture of Orange, 5; Alcohol (90 p.c.), 22·5. Dilute Chloroform Water (1 in 1000), *q.s.* to make 100. Prepare by repercolation. Dose. ½ to 1 fl. drm. —*Farr* and *Wright*, *P.J.* '06, i. 165 and '07, i. 621; *C.D.* '06, i. 252; *Y.B.P.* 1907, 250.

This appears in the *B.P.C.*

INFUSUM AURANTII COMPOSITUM CONCENTRATUM.—Dried Bitter-Orange Peel, in No. 10 powder, 20; Dried Lemon Peel, in No. 10 powder, 5; Cloves, freshly powdered, 2·5; Tincture of Lemon, 5; Tincture of Orange, 5; Alcohol (90 p.c.), *q.s.* Dilute Chloroform Water (1 in 1000), *q.s.* to make 100. Macerate the powdered Cloves in 20 of the Alcohol for 12 hours, filter through Cotton-Wool, and pass through the marc sufficient Alcohol to make the filtrate measure 20; add the tinctures and set aside, mix the other powders, and submit them to macero-expression with dilute Chloroform Water, adding the mixed tinctures to the reserved portion. Dose. ½ to 1 fl. drm. —*Farr* and *Wright*, *P.J.* '06, i. 165 and '07, i. 621; *C.D.* '06, i. 252; *Y.B.P.* 1907, 249.

This appears in the *B.P.C.*

VINUM AURANTII DETANNATUM.—Orange Wine, 1 gallon; Gelatin, in No. 100 powder, ¼ oz.; macerate for 24 hours and decant.

It is recommended by F. C. J. Bird that Gelatin in No. 100 powder should be used in place of Gelatin cut small, as recommended in the *B.P.C. Formulary* 1901, it being found possible by this process to completely detannate an average sample of Wine in 24 hours with the aid of occasional shaking, or in 8 hours if frequently agitated. Care must be taken to keep the temperature of maceration at or below 15·5° C., or during extremely hot weather the Gelatin will probably pass into solution.—*P.J.* '99, ii. 133.

This suggestion has been incorporated in the *B.P.C.* as follows:—

Orange Wine, 100; Gelatin, in No. 100 powder, 0·15. Macerate for 24 hours at a temperature not exceeding 15·5° C., with frequent agitation, and afterwards decant.

OLEUM AURANTII CORTICIS.—A volatile Oil, extracted by mechanical means from Fresh Orange Peel; both varieties of Orange Peel are used; that from *Citrus Aurantium*, L., var. *Bigaradia*, Hook. f., is known as **Essence de Bigarade,** and that from *Citrus Aurantium*, L., as **Essence de Portugal;** the former yields the finest Oil.

A pale yellowish liquid, with neutral reaction, having the odour of Orange Peel. At least 90 p.c. of the Oil consists of dextrorotatory Limonene.

By keeping, the Oil becomes thicker and acquires a disagreeable terebinthinate taste, which may be prevented by mixing it while fresh with 10 p.c. of Absolute Alcohol. It should be kept in well-stoppered dark amber-tinted glass bottles in a cool place.

Solubility.—Soluble 1 in 7 of Alcohol (90 p.c.), and in all proportions of Absolute Alcohol.

Foreign Pharmacopœias.—Official in Austr. and Belg., sp. gr. 0·848 to 0·852; Dutch, sp. gr. 0·850 to 0·870; Fr., sp. gr. 0·848 to 0·853; Hung. and Jap., sp. gr. 0·850 to 0·860; Port., sp. gr. 0·835 to 0·850; Mex., sp. gr. 0·837; Span., 0·835 to 0·844; U.S., sp. gr. 0·842 to 0·846 at 25° C. (77° F.); not in Dan., Ger., Ital., Norw., Russ., Swed. or Swiss.

Tests.—The oil of sweet orange has a sp. gr. of 0·848 to 0·852, that from bitter orange 0·854 to 0·857. Both have a characteristic orange odour. The oil has a boiling point of 175° to 180° C. (347° to 356° F.), between which temperatures about nine-tenths of the oil distils over. The oil of sweet orange has an optical rotation in a tube of 100 mm. diameter of + 96° to + 98° at 20° C. (68° F.); that of the bitter orange is between + 90° and + 93°.

The more generally occurring sophistications are Turpentine Oil and the terpenes remaining from the manufacture of terpeneless Oil of Lemon and Oil of Orange. Turpentine Oil may generally be detected directly by the optical rotation, or by a determination of the optical activity of the first 10 p.c. fraction.

The optical rotation of this first 10 p.c. fraction should not materially differ from that of the original oil.

The terpenes remaining from the manufacture of terpeneless Lemon Oil are readily detected by the optical rotation, but terpenes from terpeneless Oil of Orange are detected with much greater difficulty. They reduce the colour of the oil and produce a difference in the odour and taste.

ELIXIR AURANTII (formerly *U.S.*, now omitted).—Sprinkle or spray 1 fl. oz. of Oil of Orange over 2 oz. of Cotton-Wool; pack it tightly in a percolator and pass through it a mixture (Alcohol 1, Water 3), sp. gr. 0·971, till 200 fl. oz. of a clear percolate are obtained, in which dissolve, without heat, Sugar 100 oz.; all by weight.

A better method of disseminating the Oil is to sprinkle it upon blotting paper pulp this with the diluted Alcohol, allow it to stand for 24 hours, and filter.

ELIXIR AROMATICUM.—Compound Spirit of Orange, 1·2; Syrup, 37·5; Purified Talc, 3; Alcohol (95 p.c.), *q.s.*; Distilled Water, *q.s.* to produce 100. To the Compound Spirit of Orange add enough Alcohol to make 25, to this solution add the syrup in several portions, agitating after each addition, then 37·5 of Distilled Water. Mix the Purified Talc with the liquid and then filter through a wetted filter, returning the first portions of the filtrate until a transparent liquid is obtained. Lastly, wash the filter with a mixture of Alcohol 1 volume and Distilled Water 3 volumes, until the product measures 100.—*U.S.P.*

This has been incorporated in the *B.P.C.*, which appears to direct twice as much Compound Spirit of Orange, but the *B.P.C.* Compound Spirit is only half the strength of the *U.S.P.* This, however, has been altered in the *B.P.C. Supplement*; the Spiritus Aurantii Compositus (*see* below) has now been doubled in strength, and half the quantity of it used, and the amended formula for Elixir Aromaticum will agree with that given above for *U.S.P.*

ELIXIR SIMPLEX.—Oil of Bitter-Orange, 30 minims; Alcohol (90 p.c.), 6 fl. oz.; dissolve and add Distilled Cinnamon Water, 7 fl. oz.; Syrup, 7 fl. oz.; mix. Filter through paper moistened with Alcohol (45 p.c.) and well sprinkled with Kaolin, returning the first portions of filtrate until it passes through bright. —*B.P.C. Formulary* 1894 omitted in 1901.

Dose.—20 to 60 minims = 1·2 to 3·6 c.c.

Tincture of Orange, 7·50; Syrup, 40; Distilled Water, *q.s.* to make 100. —*B.P.C.*

This is the same formula as given under Pepsin.

SPIRITUS AURANTII COMPOSITUS. (*U.S.*).—Oil of Orange, 10; Oil of Lemon, 2½; Oil of Coriander, 1; Oil of Anise, ¼; Alcohol (95 p.c.), to make 50.

The *B.P.C.* Spiritus Aurantii Compositus employ Alcohol (90 p.c.) to make 100 and is therefore half this strength. This has been altered in the *B.P.C. Supplement*, reducing the quantity of Alcohol (90 p.c.) to make 50, so that the formula will correspond in strength to the *U.S.* preparation, but using Alcohol (90 p.c.) in place of *U.S.P.* Alcohol (95 p.c.).

AURANTII CORTEX SICCATUS. DRIED BITTER-ORANGE PEEL.

The dried outer part of the Pericarp of *Citrus Aurantium*, L., var. *Bigaradia*, Hook. f.

Official Preparations.—Infusum Aurantii and Infusum Aurantii Compositum.

Foreign Pharmacopœias.—Official in Austr., Dan., Dutch, Fr., Ger., Hung., Ital. (Arancio Amaro), Jap., Norw., Port. (Laranjeira Azeda), Russ., Swed. and Swiss; U.S., Aurantii Amari Cortex, also Aurantii Dulcis Cortex.

Descriptive Notes. Bitter-Orange Peel occurs in English commerce in three forms, viz., English, exotic and Maltese. The English is more carefully dried, reddish-orange externally and nearly white on the inner surface, in long strips about ⅓ in. (8 mm.) wide and more or less curled in drying. The exotic is less carefully dried and of a duller orange-red or brownish-red colour externally, and a dirty white colour on the inner surface. The Maltese resembles the exotic, except that it occurs in very slender strips about 2 lines wide only, is cut up into shorter pieces, and has less of the mesocarp or white spongy portion attached to the zest or rind. The official description simply directs that it should be in thin strips, but as the colour must be orange-red, it is evident that the English-dried kind is intended. The *U.S.P.* describes the dried peel as of a brownish-green colour, and in strips or quarters, thus apparently admitting the badly dried W. Indian peel which is usually dried in quarters. The *P.G.* describes the dried peel as brownish, and directs that it should be prepared by softening the rind in cold Water for a quarter of an hour, pouring off the Water and keeping the peel in a cool place until the next day when the white spongy tissue should be cut off and the outer portion dried. Dried Orange Peel if long kept loses its bright colour and becomes brownish-red.

Preparations.

INFUSUM AURANTII. INFUSION OF ORANGE PEEL.

Dried Bitter-Orange Peel, 1; boiling Distilled Water, 20. Infuse for 15 minutes. (1 in 20)

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.

Fr. (Tisane d'Oranger), Leaves, 5; boiling Water, 1000.

INFUSUM AURANTII COMPOSITUM. COMPOUND INFUSION OF ORANGE PEEL.

Dried Bitter-Orange Peel, ½ oz.; Fresh Lemon Peel, ¼ oz.; Bruised Cloves, 55 grains; boiling Distilled Water, 20 oz. Infuse for 15 minutes. (1 in 40)

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.

TINCTURA AURANTII. *See* AURANTII CORTEX RECENS.

Formerly two Tinctures were official, one from Fresh Peel and the other from Dried Peel; the latter is now omitted.

AURANTII FLORIS AQUA.

ORANGE-FLOWER WATER.

N.O.Syn.—AQUA NAPHÆ.

FR., EAU DE FLEUR D'ORANGER; GER., POMERANSENBLÜTENWASSER; ITAL., ACQUADI FIORE DI ARANCIO; SPAN., AGUA DESTILADA DE AZAHAR.

Commercial Orange-flower Water prepared by a process of distillation from the Flowers of the Bitter-Orange tree, *Citrus*

Aurantium, L., var. *Bigaradia*, Hook. f., diluted with twice its volume of Distilled Water. It keeps best in the undiluted state, and should therefore be diluted only as required.

U.S. directs the Triple Extract to be diluted with an equal volume of Distilled Water. Swiss use the undiluted Water.

Medicinal Properties.—Both the **Water** and the **Syrup** are used as flavouring agents, about 1 of the Concentrated Water to 8 of Distilled Water; it is also used in eye lotions.

Official Preparation.—Syrupus Aurantii Floris. Contained in Mistura Olei Ricini, and Syrupus Calcii Lactophosphatis.

Not Official.—Oleum Aurantii Florum (Oleum Neroli).

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Fr. (Eau Distillée de Fleur d'Oranger), Hung., Ital. (Acqua Distillata di Arancio), Jap., Mex. (Agua destilada de corteza de naranja amarga), Port. (Agua de Flores de Laranjeira), Russ., Span. (Agua Destilada de Azahar), Swed., Swiss and U.S. Not in Dan., Ger. or Norw.

Preparation.

SYRUPUS AURANTII FLORIS. SYRUP OF ORANGE FLOWER.

Dissolve 6 of Refined Sugar in 2 of boiling Distilled Water; add 1 of undiluted Orange-flower Water of commerce, and make up the total weight to 9 with recently boiled Distilled Water.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Austr., O.F.W. 1, Sugar 1½; Belg., O.F. Spirit (1 Oil in 100) 1, Syrup 199; Fr. and Mex., O.F.W. 10, Sugar 18; Port., O.F.W. 7, Sugar 13; Span. and Swiss, O.F.W. 36, Sugar 64; all by weight. U.S., Sugar 85, O.F.W. to measure 100. Not in the others.

Not Official.

OLEUM AURANTII FLORUM. *Syn.* OLEUM NEROLI.—A volatile Oil, obtained by distilling fresh Orange-flowers with Water. The watery distillate constitutes the Aqua Floris Aurantii Conc. of commerce. The finest Oil is obtained from the Bitter-Orange; that from the Portugal or Sweet-Orange is not so good. From the **leaves, twigs** and **immature fruits** of both varieties is obtained the commercial **Oil of Petit Grain.**

A yellowish or brownish limpid liquid, with neutral reaction, having a powerful odour of Orange-flowers.

Solubility.—Soluble in all proportions of Alcohol (90 p.c.) or in Absolute Alcohol.

Foreign Pharmacopœias.—Official in Austr., Belg. and Swiss, sp. gr. 0·870 to 0·880; Mex., sp. gr. 0·870 to 0·878; Fr., sp. gr. 0·875 to 0·880; Span., sp. gr. 0·850 to 0·900; Ital., sp. gr. 0·872 to 0·890; Jap., sp. gr. 0·86 to 0·88; Port., sp. gr. 0·874 to 0·878. Not in Dan., Dutch, Ger., Hung., Norw., Russ., Swed. or U.S.

Tests.—The Oil has a specific gravity of 0·870 to 0·890 and a powerful characteristic odour of Orange-flowers. It should possess an optical rotation in a tube of 100 mm. diameter of + 2° to + 5° and occasionally as high as + 8°. It should form a clear solution in 1½ to 2 volumes of Alcohol (80 p.c.). A determination of the Saponification value affords a useful criterion of the purity of an Oil; that of genuine Oils being between 20 and 52 corresponding to 7 to 18 p.c. of Esters calculated as Linalyl Acetate.

The more generally occurring sophistications are Bergamot and Petit Grain Oils, which being composed largely of the same chemical constituents as Neroli

Oil can only be detected when in relatively large quantities, the recognition of small amounts being next to impossible. The Saponification value here affords the best criterion.

Not Official.

AURI BROMIDUM.

$AuBr_3$, eq. 433·75.

In dark brown masses, soluble in Water. It has been used on the Continent for the relief of hysteria and epilepsy.

The salt should be kept in well-stoppered bottles of a dark amber tint.

The Tribromide obtained from Merck was soluble about 1 in 75 of Water.

It appears to be about ten times more active than the more commonly used Bromides, and has been given in $\frac{1}{4}$ (increased to $\frac{1}{2}$) grain doses in severe cases of hysteria and epilepsy.—*L.* '90, i. 869.

Dose.—$\frac{1}{10}$ to $\frac{1}{4}$ grain = 0·0067 to 0·016 gramme.

Prescribing Notes.—*Dispensed in* **pills** *with Massa Kaolini, or in compressed Tablets.*

Official in Mex., Bromuro de Oro.

AURI ET POTASSII BROMIDUM.—Brownish-black needle-shaped crystals. Readily soluble in Water. Used for the same purposes as for the Tribromide.

Dose.—$\frac{1}{3}$ grain = 0·021 gramme.

LIQUOR AURI ET ARSENII BROMIDI.—Arsenious Acid, 0·25 gramme; Gold Tribromide, 0·325 gramme; Bromine Water and Distilled Water, of each a sufficient quantity to make 100 c.c.—*U.S.N.F.* 1896 and 1906.

10 minims of this solution contain $\frac{1}{32}$ grain of Tribromide of Gold and the equivalent of $\frac{1}{13}$ grain of Tribromide of Arsenic.

Arsenious Acid, in powder, 40 grains; Potassium Carbonate, 40 grains; Bromine, 100 grains; Gold, in leaf, 13·5; Distilled Water, *q.s.* to 20 fl. oz. (Wright).—*Y.P.B.* 1896, 354.

10 minims contains an amount of Arsenium in combination equal to $\frac{1}{24}$ grain of Arsenious Acid and $\frac{1}{32}$ grain of Gold Tribromide.

This has been incorporated in the *B.P.C.* under the title **Liquor Auri et Arsenii Bromatus.**

This liquor has been found useful in rheumatism.—*L.* '95, ii. 921; '00, i. 72; it is also combined with Mercury Oxybromide in syphilitic affections.

Not Official.

AURI CHLORIDUM.

Under this heading are arranged the following varieties:—

1. **Pure Chloride of Gold,** $AuCl_3$, containing about 65 p.c. of metallic Gold. **Official in** Port. (Chloreto de Ouro), and Mex. (Cloruro de Oro).
2. **Chloride of Gold and Sodium** (Commercial 'Chloride of Gold'), the crystallised double salt $AuCl_3.NaCl.2H_2O$, containing 50 p.c. of metallic Gold. **Official in** Fr. (Chlorure d'Or et de Sodium), Port. Chloreto de Ouro e de Sodio), and Mex. (Cloruro de Oro y Sodio).
3. **Commercial Chloride of Gold and Sodium.** Commercial Chloride of Gold and Sodium is the above crystallised salt mixed with an equal weight of Chloride of Sodium, and contains 25 p.c. of metallic Gold.
4. **Auri et Sodii Chloridum, U.S.** A mixture composed of equal parts of anhydrous Gold Chloride and anhydrous Sodium Chloride,

and which contains not less than 30 p.c. of metallic Gold. **Official in** Russ. (Auro-natrium Chloratum).

The salts should be kept in well-stoppered bottles of a dark amber tint.

Some foreign samples of commercial Chloride of Gold are the double Chloride of Gold and Potassium $AuCl_3.KCl.2\frac{1}{2}H_2O$, corresponding to about 47 p.c. of metal.—*P.J.* (3) xxii. 902.

Medicinal Properties.—It has been given on the Continent for amenorrhœa and secondary syphilis. Chloride of Gold and Sodium has been used in tertiary syphilis, spinal sclerosis, hystero-epilepsy, asthma, chorea, and in uterine affections.

Dose.—$\frac{1}{16}$ to $\frac{1}{4}$ grain = 0·004 to 0·016 gramme.

Prescribing Notes.—*It may be given in the form of* **pills** *made with Massa Kaolini; or in aqueous solution. Its solutions should be protected from white light.*

It is also used in photography.

Not Official.

AZADIRACHTA INDICA.

INDIAN AZADIRACH.

Syns.—NEEM BARK, MARGOSA BARK.

The dried Bark of the stem of *Melia Azadirachta*, L.: **Infusum Azadirachtæ Indicæ** (1 in about 109), dose $\frac{1}{2}$ to 1 fl. oz. = 14·2 to 28·4 c.c.; and **Tinctura Azadirachtæ** (1 in 10), dose 30 to 60 minims = 1·8 to 3·6 c.c.; are official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

BALSAMUM CANADENSE.

See TEREBINTHINA CANADENSIS.

Not Official.

BALSAMUM DIPTEROCARPI.

GURJUN BALSAM.

A balsamic exudation, obtained from the Trunk of *Dipterocarpus turbinatus*, Gärtn. f., and other species by incision and the application of heat. Imported from the East Indies. It is an oleo-resin, constituting a transparent liquid of the consistence of Olive Oil, lighter than Water, and of a dark brown sherry colour, slightly fluorescent.

Medicinal Properties.—Similar to those of Copaiba. Useful for leprosy. Mr. J. D. Hillis, of the Leper Asylum in British Guiana, is greatly in favour of it. —*L.* '80, i. 659; *M.P.* '89, i. 664; *see* also *L.* '90, i. 136. Von Reisnen gives Wood Oil internally, commencing with daily doses of 5 drops, increasing gradually to 70 or more, suspending the treatment when intolerance is shown. Externally the leprous parts are treated with an ointment of Gurjun Balsam, 3 parts; Lanolin, 1 part.—*P.J.* '95, ii. 27.

It is used in India as a substitute for Balsam of Copaiba in gonorrhœa; also as a natural varnish.

Prescribing Notes.—*Best prescribed in* **capsules** *for internal administration. As a local application in the form of an* **emulsion** *made with Lime Water, or as an ointment made with a Lanolin basis.*

Descriptive Notes.—It is also known as Wood Oil, but must not be confounded with the Wood Oil of China, which is a drying fixed Oil, used in China instead of Linseed Oil, and is derived from *Aleurites Fordii*, Hemsl., and other species; it is also known as Tung Oil. To prevent confusion only the names Gurjun Oil or Gurjun Balsam should be used for Balsamum Dipterocarpi.

BALSAMUM PERUVIANUM.

BALSAM OF PERU.

FR., BAUME DU PEROU; GER., PERUBALSAM; ITAL., BALSAMO PERUVIANO; SPAN., BALSAMO DEL PERU.

A dark brownish viscid liquid, obtained (by special treatment) from the Trunk of *Myroxylon Pereiræ*, Klotzsh, growing in San Salvador, Central America.

It consists mainly of Cinnamein, the Benzyl Ester of Benzoic Acid, with a smaller proportion of the Benzyl Ester of Cinnamic Acid, free Cinnamic Acid, traces of Vanillin and Peruresinotannol Esters of Cinnamic and Benzoic Acid.

Solubility.—1 in 1 of Alcohol (90 p.c.); when more than 3 of Alcohol are added to 1 of Balsam it becomes turbid; in all proportions of Chloroform; insoluble in Olive Oil.

Medicinal Properties.—Stimulant and disinfectant expectorant. Useful in chronic bronchitis; contra-indicated in acute bronchial catarrh because of its stimulant action; also used as a urinary antiseptic.

Externally as an **ointment** for chronic indolent ulcers and for sore nipples; for scabies and pediculi and parasitic skin diseases, to relieve itching in urticaria, and prevent or heal bedsores.

The Balsam contains an Essential Oil, the vapour of which is extremely toxic to the acarus of itch. The patient is rubbed in the evening for fifteen or twenty minutes with the Balsam; it is not necessary to rub hard, as the vapour is sufficient to kill the parasite.—*L.* '96, i. 1101.

As a dressing in warfare; it may be left on for 20 days without removal and disinfection, and sterilisation is unnecessary.—*L.* '04, ii. 1807.

Not to be applied to large areas of skin for scabies in children, small-bodied adults, and patients with renal trouble, as it may produce albuminuria or nephritis.—*B.M.J.* '07, i. 972.

Superior to sulphur in scabies.—*B.M.J.* '07, ii. 1710.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Prescribing Notes.—*Given as an* **emulsion** *with Mucilage of Gum Acacia, or Sugar and yolk of Egg with Water.*

Not Official.—Unguentum Peruvianum, and Unguentum Peruvianum Resinosum.

Foreign Pharmacopœias.—Official in Austr., sp. gr. 1·14 to 1·16; Belg., 1·137 to 1·150; Dutch, sp. gr. 1·14 to 1·145; Dan., Ital., Norw. and Swed., sp. gr. 1·135 to 1·150; Fr., sp. gr. 1·135 to 1·150; Ger., sp. gr. 1·140 to 1·150; Hung., sp. gr. 1·137 to 1·150; Jap., sp. gr. 1·140 to 1·162; Russ., sp. gr. 1·135 to 1·145; Port., sp. gr. 1·15; Span., sp. gr., 1·13 to 1·16; Swiss, sp. gr. 1·145 to 1·155; U.S., sp. gr. 1·140 to 1·150, at 25° C. (77° F.); Mex., 1·14 to 1·145.

Descriptive Notes.—Balsam of Peru is not a natural exudation, but is a pathological product formed after the bark has been beaten and scorched. It is a nearly black, oily liquid, heavier than Water, and with a balsamic rather smoky odour, which is fragrant and agreeable when the balsam is smeared on paper and warmed. It has not a very pronounced taste, but leaves an unpleasant burning sensation in the fauces. It is liable to be adulterated with several substances, *see* Tests. An artificial Balsam of Peru, called Perugen, is now sold in commerce, but its use in medicine is not justified, since it cannot be said to be derived from *Myroxylon Pereiræ*. With the Nitric Acid test of Cæsar and Loretz, *P.J.* (4) xxi., p. 579, Perugen gives an intense olive-green colour, instead of the golden yellow yielded by pure Balsam.

Tests.—The distinguishing tests for Peruvian Balsam: are (1) the specific gravity, which should be 1·137 to 1·150 [the *U.S.P.* gives 1·140 to 1·150 at 25° C. (77° F.); the *P.G.* 1·140 to 1·150]; (2) the presence of from 57 to 60 p.c. of Cinnamein as determined by first shaking a weighed quantity of 5 grammes of the Balsam with 5 c.c. of Sodium Hydroxide Solution (15 p.c.) and shaking the latter solution with three successive portions each of 15 c.c. of Ether (sp. gr. 0·720), the residue from the ethereal solution on evaporation being dried until the loss between two weighings at intervals of five minutes does not exceed 0·01 gramme; (3) the percentage of Potassium Hydroxide required to saponify the residue, which should be from 23·23 to 23·76 p.c. as determined by saponifying the weighed residue from the Ether treatment with Normal Volumetric Alcoholic Potassium Hydroxide Solution titrating the uncombined alkali with Normal Volumetric Sulphuric Acid Solution.

The *U.S.P.* requires the Balsam to contain at least 56 p.c. of Cinnamein as determined by a single extraction with Ether from a mixture of the Balsam and Sodium Hydroxide Test Solution, the residue from the Ether treatment should require not less than 23·49 p.c. of Potassium Hydroxide for saponification. The *P.G.* test indicates 56 p.c. of Cinnamein as determined by extraction with three successive portions of Ether from a mixture of the Balsam, Water, and Sodium Hydroxide Solution (15 p.c.); the Ether residue should require not less than 23·66 p.c. of Potassium Hydroxide for its saponification. Both *U.S.P.* and *P.G.* employ Semi-normal Volumetric Hydrochloric Acid Solution for titrating the uncombined alkali after saponification. Attention has been called (*P.J.* '01, i. 29) to the ambiguous wording of the Pharmacopœia test. The original test directs the exhaustion of the Balsam with Ether and treatment of the filtered ethereal solution with Sodium Hydroxide Solution. The original directions are that the Balsam shall be shaken with Sodium Hydroxide Solution (15 p.c.) and then washed with Ether, the Ether removed and the residue weighed after suitable drying. The residue would be taken to mean the residual Balsam after treatment with Sodium Hydroxide Solution (15 p.c.) and Ether, whereas the residue of Cinnamein and other Ether soluble bodies is intended.

A determination of the Acid, Ester and Saponification value of the original Balsam is useful in judging of the quality of a sample. The *B.P.* does not make any reference to such determinations. The *U.S.P.*

gives a quantitative test for limit of Acid Resins, and according to the test these should not amount to more than 14·69 p.c. reckoned as Cinnamic Acid. No saponification test on the original Balsam is given. The *P.G.* omits the 'limit of Acid Resins,' but includes a Saponification test, the Balsam being required to neutralise not less than 22·46 p.c. of Potassium Hydroxide, indicating a Saponification value of 224·6.

The more generally occurring impurities are Copaiba Balsam, Colophony, fixed oils, *e.g.*, Olive and Castor Oils; Ethylic Alcohol, Turpentine, Storax and Gurjun Balsam. As a general rule adulterants raise the Acid and lower the Saponification values. The *B.P.* employs trituration with Lime as a test for ensuring the absence of Copaiba and Resins, and when warmed until the volatile matter is dissipated and charring commences, the absence of fatty odour is assumed to indicate the absence of Castor and other Fatty Oils. No diminution in volume when equal volumes of the Balsam and Water are shaken together indicates the absence of Ethylic Alcohol. The separation of about 40 p.c. of Resin and a clear pale brown supernatant fluid with only a slight fluorescence, when one part of the Balsam is treated with three parts of Carbon Bisulphide, is officially stated to indicate the absence of Gurjun Balsam. The trituration with Lime is included in the *U.S.P.*, though the latter part of the test is omitted; the test was official in *P.G.* iii., but is omitted altogether in *P.G.* iv. Neither *U.S.P.* nor *P.G.* includes a test for Ethyl Alcohol, nor the Carbon Bisulphide test. Both *U.S.P.* and *P.G.* include a Sulphuric Acid test for Fixed Oils and Gurjun Balsam. The *U.S.P.* alone includes a test with Benzin and concentrated Nitric Acid for the detection of Resin, the balance of the Benzin solution being shaken with Copper Acetate Solution, the non-production of a green or bluish-green coloration indicating the absence of Resin, Turpentine, Storax, Fatty Oils, etc. Dieterich is of opinion that qualitative reactions are devoid of any value in judging the quality of a Balsam, and suggests including a determination of the Resin-ester. The following test has been suggested by Dieterich (*Berichte der deutschen pharmaceutischen Gesellschaft* 18, 135) for inclusion in the *B.P.* tests:—The alkaline solution of the Resin obtained in the assay of the balsam is acidified and shaken with 10 c.c. of Ether, 5 c.c. of this solution is poured into a test-tube, and after inclining the tube 1 c.c. of concentrated Sulphuric Acid is allowed to flow in, the test-tube is brought into a vertical position, and after a short time is again inclined and 2 c.c. of concentrated Hydrochloric Acid allowed to flow in. A reddish-brown, but not a green or greenish-brown zone should develop between the Hydrochloric Acid and the Ether, a red zone between the Sulphuric Acid and the Hydrochloric Acid. This test is intended to detect the presence of synthetic Balsam of Peru (Perugen).

Calcium Oxide.—When the Balsam is mixed with half its volume of Calcium Hydroxide and heating on a water-bath for half an hour a solid mass should not be formed, indicating the absence of Rosin, Storax, or Copaiba, *U.S.P.*

Sulphuric Acid.—If 10 drops of the Balsam be triturated with 20 drops of Sulphuric Acid a tough homogeneous mass results, which when washed with cold

Water develops a violet colour on its surface, and, after draining out the Water a brittle mass is obtained which may be crumbled up, indicating the absence of fixed oils, *P.G.* and *U.S.P.*

Benzin and Nitric Acid.—If 1 gramme of the Balsam be shaken with 5 c.c. of Petroleum Benzin, the mixture warmed on a water-bath for 10 minutes, and sufficient solvent added to replace loss by evaporation, then if 2 c.c. of this Benzin Solution be evaporated and treated with a drop of Nitric Acid, sp. gr. 1·42, a permanent green or bluish-green colour should not be produced (absence of Resin), *U.S.P.* The remaining 3 c.c. of Benzin Solution when shaken with an equal volume of aqueous Solution of Copper Acetate (1–1000) should not be coloured green or bluish-green (absence of Resin, Turpentine, Storax, Fatty Oils, etc.), *U.S.P.*

Saponification.—Let 1 gramme of Balsam be dissolved in 20 c.c. of Alcohol (90 p.c.) and 50 c.c. of Semi-normal Alcoholic Solution of Potassium Hydroxide be added, then let the mixture be heated on a water-bath for half an hour. Dilute with 300 c.c. of Water and titrate with Semi-normal Solution of Hydrochloric Acid; not more than 42 c.c. of the Acid solution should be necessary to neutralise the excess of Potassium Hydroxide Solution, *P.G.*

Volumetric Determination of Free Acid.—The *U.S.P.* directs 1 gramme of Balsam to be dissolved in 100 c.c. of Alcohol (94·9 p.c.), and titrated with Semi-normal Alcoholic Solution of Potassium Hydroxide, using 1 c.c. of Phenolphthalein T.S. as indicator, when not more than 2 c.c. of the Volumetric Alkali Solution should be required to produce a pink colour.

Gravimetric and Volumetric Determination of Cinnamein.—The *B.P.* quantities are outlined in the large type notes above, the *P.G.* quantities are 2·5 grammes of Balsam, 5 c.c. Sodium Hydroxide Solution (15 p.c. w/w) and 5 c.c. of Water, washing with three quantities of Ether 10 c.c. each. The final residue should amount to at least 1·4 grammes. The *U.S.P.* directs the mixture of 3 grammes of Balsam with 30 c.c. Sodium Hydroxide T.S., then washing with 60 grammes of Ether, and the careful evaporation of 51·5 grammes of the ethereal liquid, when not less than 1·4 grammes of residue of constant weight should be obtained (presence of at least 56 p.c. of Cinnamein). The residue obtained from the *B.P.* gravimetric determination of Cinnamein is dissolved in 40 c.c. of Alcohol (90 p.c.), and saponified under a reflux condenser for one hour with 20 c.c. of Normal Volumetric Alcoholic Potassium Hydroxide Solution; the excess of Volumetric alkali solution being titrated with Normal Volumetric Sulphuric Acid Solution, to neutralise this excess from 7·2 to 8·1 c.c. should be necessary. The *P.G.* and *U.S.P.* direct the solution of the weighed residue in 25 c.c. of Alcohol, mixing with 25 c.c. Semi-normal Volumetric Alcoholic Solution of Potassium Hydroxide and carefully heating on a water-bath for half an hour; then after the addition of 10 drops (1 c.c., *U.S.P.*) of Phenolphthalein T.S. as indicator, the mixture should require not more than 13·2 c.c. Semi-normal Volumetric Solution of Hydrochloric Acid for exact neutralisation.

Not Official.

UNGUENTUM PERUVIANUM.—Balsam, 1; Lard, 7.

This has been incorporated in the *B.P.C.*

UNGUENTUM PERUVIANUM RESINOSUM. — Balsam, 1; Resin Ointment, 1.

BALSAMUM TOLUTANUM.

BALSAM OF TOLU.

FR., BAUME DE TOLU; GER., TOLUBALSAM; ITAL., BALSAMO TOLUTANO;
SPAN., BALSAMO DE TOLU.

A yellowish-brown, soft, tenacious mass, which exudes from the Trunk of *Myroxylon Toluifera*, H. B. and K., on incision. Imported from the northern ports of Colombia, South America.

Balsam of Tolu consists principally of the Cinnamic and Benzoic Esters of Tolu-resinotannol, from 12 to 15 p.c. of free Cinnamic and Benzoic Acids, about 7·5 p.c. of Cinnamein, an oily fluid composed mainly of the Benzyl Ester of Benzoic Acid and in lesser amount of the Benzyl Ester of Cinnamic Acid, and a small quantity of Vanillin.

Solubility.—1 in 1 of Alcohol (90 p.c.); 1 in 3 of Benzol; 2 in 1 of Chloroform; 1 in 1 of Glacial Acetic Acid; insoluble in Petroleum Spirit; nearly insoluble in Carbon Bisulphide.

Medicinal Properties. Similar to those of the Balsam of Peru, but not used externally.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Prescribing Notes.—*Usually given as the* **Syrup,** *which is useful as a flavouring agent, and as an expectorant in cough mixtures. The* **Tincture** *when mixed with Water requires the use of Mucilage of Gum Acacia.*

Official Preparations.—Of the **Balsam,** Syrupus Tolutanus and Tinctura Tolutana; used in the preparation of Tinctura Benzoini Composita. The **Syrup** is contained in Mistura Ammoniaci. The **Tincture** is used in the preparation of Tolu Basis which is contained in Trochiscus Acidi Carbolici, Trochiscus Morphinæ, and Trochiscus Morphinæ et Ipecacuanhæ.

Not Official.—Liquor Tolutana pro Syrupo, Syrupus Tolutanus.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S. Not in Hung.

Descriptive Notes.—Balsam of Tolu when freshly imported is a light brown balsamic resin, soft enough to receive the impression of the finger, but gradually becoming harder and brittle in cold weather, but is even then easily softened by the warmth of the hand. It is exported from the United States of Colombia in cylindrical tins containing about 10 lb., but from New York in square tins containing about 44 lb. It has a delicate, fragrant, characteristic odour, especially when warmed, an aromatic and a feebly acid taste, due to the presence of Cinnamic and Benzoic acids, crystals of which can readily be seen with a lens when a thin layer of the balsam is pressed between two warm plates of glass.

Tests.—The distinguishing tests for this Balsam are its aromatic odour and taste; physical appearance; the presence of numerous crystals when thin sections are examined with a pocket lens; the distinctly crystalline residue obtained on extracting a weighed quantity of 5 grammes of the Balsam with two successive quantities each of 25 c.c. and 10 c.c. of Carbon Bisulphide and subsequent evaporation of that solvent; and that not less than one-third of its weight of Potassium Hydroxide should be required for the saponification of this residue. This test of the *B.P.*, though shown (*Y.B.P.* '06, 206; *C.D.* '06, ii. 164; *P.J.* '06, ii. 74) to be in many cases valuable as a means of discriminating between genuine and spurious balsams, may still be improved upon in several important particulars. The Carbon Bisulphide solution should be evaporated and the residue dried at a temperature not exceeding 43·3° C. (110° F.). Potassium Hydroxide in the form of Normal Volumetric Alcoholic Solution might be inserted in the place of the Potassium Hydroxide in the requirement as to the quantity necessary for saponification. One-third of the weight of the residue is considered to be too high, and it is suggested that the sentence should read not less than 290 parts of Potassium Hydroxide per 1000 parts of dry residue. A saving of time would, moreover, be accomplished by expressing the percentage of Potassium Hydroxide required, on the original Balsam instead of on the residue, the evaporation of the Carbon Bisulphide would then not require to be carried beyond the stage necessary for the removal of the solvent. The Carbon Bisulphide test is not included in the *U.S.P.* and *P.G.*, but both these Pharmacopœias give an Acid and Ester value. According to the *U.S.P.* the amount of Potassium Hydroxide required to neutralise the acidity should be not less than 11·14 p.c. nor more than 16·72 p.c. corresponding to an Acid value of 111·4 to 167·2. The *P.G.* requires not less than 11·23 p.c. nor more than 16·84 p.c. corresponding to an Acid value of 112·3 to 168·4. The amount of Potassium Hydroxide required by the *U.S.P.* to saponify the Esters should be not less than 15·32 p.c. nor more than 18·95 p.c. corresponding to a Saponification value of 153·2 to 189·5. That required by the *P.G.* is not less than 15·44 p.c. nor more than 19·09 p.c., corresponding to a Saponification value of 154·4 to 190·9.

The more generally occurring impurities are Resin and Copaiba. The *B.P.* relies solely on the sufficient proportion of Benzoates and Cinnamates as indicated by the Carbon Bisulphide residue and its Saponification figure; the *P.G.* on the Acid and Saponification value, whilst the *U.S.P.* gives in addition confirmatory qualitative tests with Sulphuric Acid on a solution in Glacial Acetic Acid of residue obtained on evaporating a Carbon Bisulphide solution of the Balsam; and the non-production of a green coloration when a 1 in 8 solution of the Balsam in Benzin is shaken with an equal volume of a 1 in 1000 aqueous Copper Acetate solution.

The following test has been suggested by Dieterich for the detection of Colophony:—A weighed quantity of 0·5 gramme of the balsam is mixed with 5 c.c. of Water, and 5 c.c. of Sodium Hydroxide Solution (15 p.c. w/w), the mixture is shaken with 10 c.c. of Ether, separated, acidified, and again shaken with Ether. A measured portion of the ethereal solution is introduced into a test-tube, the tube inclined and 1 c.c. of concentrated Sulphuric Acid allowed to flow in, again brought into a vertical position, and after a short time again inclined, and 2 c.c. of Hydrochloric Acid allowed to flow in. It should produce a red zone between the Hydrochloric Acid and the Ether, and a deep red zone between the Sulphuric Acid and the Hydrochloric Acid. A weighed quantity of 1 gramme of the balsam dissolved in 5 c.c. of Glacial Acetic Acid and 2 drops of Sulphuric Acid dropped into the solution, previously heated to boiling, should produce a bluish-violet or bluish-green colour.

Carbon Bisulphide, Glacial Acetic, and Sulphuric Acids.—If 0·5 gramme of the Balsam be shaken with 25 c.c. of Carbon Bisulphide, allowed to stand for 30 minutes, filtered, and the filtrate evaporated to dryness, a residue is obtained which when dissolved in Glacial Acetic Acid should not yield a green colour on the addition of a few drops of Sulphuric Acid, *U.S.P.*

Benzin and Copper Acetate.—If 1 gramme of the Balsam be agitated with 8 c.c. Petroleum Benzin for 5 minutes, the supernatant liquid should not be coloured green when shaken with an equal volume of a 1 in 1000 solution of Copper Acetate, indicating the absence of Resin and Copaiba, *U.S.P.*

Acid Value. If 1 gramme of the Balsam be dissolved in 50 c.c. of Alcohol and 10 drops (1 c.c. *U.S.P.*) of Phenolphthalein Solution be added, then the addition of not less than 4 c.c. and not more than 6 c.c. of Semi-normal Volumetric Alcoholic Solution of Potassium Hydroxide should be required to produce a red colour, indicating the limit of acidity, *P.G.* and *U.S.P.*

Saponification Value.—If this liquid be mixed with more Semi-normal Alcoholic Solution of Potassium Hydroxide until the total amount used is 20 c.c., and the mixture heated on a water-bath for half an hour and allowed to cool, then on titrating with Semi-normal Volumetric Solution of Hydrochloric Acid (Semi-normal Volumetric Solution of Sulphuric Acid, *U.S.P.*) the liquid should require not less than 13·2 and not more than 14·5 c.c. of the Acid Solution to neutralise the excess of Potassium Hydroxide Solution, *P.G.* and *U.S.P.*

Preparations.

SYRUPUS TOLUTANUS. Syrup of Balsam of Tolu.

Fr., Sirop de Baume de Tolu; Ger., Tolubalsamsirop; Ital., Sciroppo di Balsamo del Tolu; Span., Jarabe de Balsamo de Tolu.

Balsam of Tolu, $1\frac{1}{4}$, is boiled with 20 of Distilled Water to produce 16 of liquid, in which (after filtration) are dissolved 32 of Sugar. When finished it should weigh 48.

A better flavoured Syrup may be made as follows:—Balsam of Tolu, $1\frac{1}{4}$; Sugar, 8. Powder the Tolu with the Sugar, macerate in Water 16, for 24 hours, with frequent agitation; filter bright, and dissolve in it (cold) Sugar 24.

In a paper read before the British Pharmaceutical Conference (*P.J.* '99, ii. 108, 116; *C.D.* '99, ii. 212, 228) the superiority of a Syrup made on the above lines has been clearly demonstrated. Six Syrups were prepared, the two samples of genuine Balsam used being previously submitted to careful examination. The Syrup prepared by the *Companion* process ranked first, having the best flavour and containing 1·12 parts of Cinnamic Acid out of 3·33 contained in the Balsam used. The *B.P.* Syrup ranked last, containing in summer 1·00, and in winter 0·60 parts of Cinnamic Acid.

Syrupus Tolutanus (*U.S.*).—Tincture of Tolu, 5, is triturated with Magnesium Carbonate, 1; and Sugar, 6; gradually adding Water 45, filtering, dissolving Sugar 76 in the liquor with aid of gentle heat, straining while hot and adding sufficient Water to make 100.

Dose.—$\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c.

Liquor Tolutanus pro Syrupo. Balsam of Tolu, 4, is dissolved in 12 of Alcohol (90 p.c.) and added to 26 of Water previously heated to 70° C. and placed in a bottle; shaken vigorously, then set aside for 24 hours, filter bright. To make **Syrup of Tolu** mix 1 of the solution with 7 times its volume of simple syrup.—(*Farr* and *Wright*) *Y.B.P.* 1899, 366.

This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in Belg., Fr., Ital., Norw., Port., Span., Swed., Swiss and U.S.; Mex. made with Tincture. Not in the others.

Belg. and Fr. have **Tablets** of Balsam of Tolu.

TINCTURA TOLUTANA. Tincture of Balsam of Tolu.

1 of Balsam of Tolu, macerated with Alcohol (90 p.c.) *q.s.* to yield 10. (1 in 10)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Belg., Dan., Fr., Swed. and U.S., 1 in 5; Port., 3 in 20. All by weight, except U.S. Not in the others.

Tests.—Tincture of Tolu has a sp. gr. of 0·860 to 0·865, it contains from 8 to 10 p.c. w/v of total solids and about 80 p.c. of Absolute Alcohol by volume.

Not Official.

BAPTISIN.

A powdered extract obtained from *Baptisia tinctoria*, R. Br. In small doses, laxative; in large doses, purgative and emetic.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme. Usually given in pill.

Not Official.

BARII SULPHIDUM.

It is somewhat difficult to obtain in a pure condition, and commercial samples as a rule do not contain more than 50 p.c. BaS.

Medicinal Properties.—The chief use of this is as a **depilatory**, for which purpose it is unequalled, removing hair with less injury to the skin than any other application.

Test.—For the estimation of BaS: 1. Make a standard Zinc Solution by dissolving 7·7 grammes of Zinc in about 75 c.c. of Diluted Hydrochloric Acid, adding excess of Ammonia Solution and diluting to 1000 c.c.; 2. Make an alkaline Lead Solution by dissolving 1 gramme Lead Acetate in about 20 c.c. of hot Solution of Potassium Hydroxide and diluting to 100 c.c.; 3. Heat to boiling 1 gramme of Barium Sulphide in about 50 c.c. of Water and titrate with the standard Zinc Solution till no black or brown colour is obtained by adding a drop of the filtered Barium Solution to a drop of the Lead indicator, spotted on a porcelain slab. Each c.c. of the Zinc Solution used is equivalent to 2 per cent. of Barium Sulphide in the sample operated upon.

Preparation.

DEPILATORY.—Barium Sulphide (containing 70 p.c. BaS, or an equivalent quantity of any other strength), in fine powder, 2; Starch, 5; Orris Root, in powder, 1. Mix.

For use make it into a thin paste with Water, apply to the part from which the hair is to be removed; after five minutes scrape off with a blunt knife.

Not Official.

BARII CHLORIDUM.

$BaCl_2$, eq, 206·78.

Colourless crystalline plates.

Solubility.—1 in 2½ of Water.

Medicinal Properties.—Occasionally given in syphilis, scrofula, and as a cardiac tonic, but requires care on account of its toxic properties.

Dose.—¼ to 2 grains = 0·016 to 0·13 gramme.

Toxic effects occur only with large doses.—*L.* '03, i. 1134.

Stated (*B.M.J.E.* '05, i. 24) to have no cumulative effect in ordinary doses, does not disturb the digestion or irritate the kidneys. Usual adult dose, 3 grains = 0·2 gramme, 3 or 4 times daily in Water.

Foreign Pharmacopœias. Official in Ger., Mex. and Swiss. Not in the others.

Tests.—An aqueous solution yields with diluted Sulphuric Acid Solution or an aqueous solution of a soluble Sulphate, a heavy white precipitate insoluble in concentrated Hydrochloric Acid and in strong Nitric Acid; with Potassium Bichromate Solution it yields a yellow precipitate soluble in diluted mineral acid. With Silver Nitrate Solution it yields a white curdy precipitate insoluble in Nitric Acid, soluble in Ammonia Solution, and in Potassium Cyanide Solution. It should yield no coloration or precipitate when acidified with Hydrochloric Acid and tested with Hydrogen Sulphide Solution. The *P.G.* includes a test for Iron, 20 c.c. of a 1 in 20 aqueous solution shall not be coloured blue by 0·5 c.c. of Potassium Ferrocyanide Solution (5 p.c.). No residue shall remain after complete separation of the Barium by Sulphuric Acid, evaporation of the filtrate and ignition at a low red heat.

Not Official.

BEBEERINÆ SULPHAS.

Dark-brown thin translucent scales, yellow when in powder, with a strong bitter taste. A preparation made from *Nectandra* or *Bebeeru* Bark (*Nectandra Rodiæi*, Schomb.), containing about 60 p.c. of alkaloids, one half being **Bebeerine** (Beberine), $C_{19}H_{21}NO_3$, eq. 308·87. It was official from 1864 till 1898.

Solubility.—Sparingly in Alcohol (90 p.c.); dissolves about 1 in 1 of Water, and the solution can be diluted up to 1 and 8 of Water, but on further dilution it precipitates until about 80 or 100 parts of Water have been added, but samples vary in this respect; readily soluble in Water containing a mineral Acid.

Medicinal Properties.—Aromatic bitter, stomachic tonic, an imperfect substitute for Quinine.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

Prescribing Notes.—*Given in* **solution,** *or in* **pills** *made with 'Dispensing Syrup.'*

The following pure products are commercial: **Bebeerine pure,** slightly soluble in Water, readily in Alcohol, Chloroform and Ether; **Bebeerine Hydrochloride** and **Bebeerine Sulphate,** are both readily soluble in Water and Alcohol. Dose of the two latter 1 to 2 grains = 0·06 to 0·13 gramme.

Not Official.

BELÆ FRUCTUS.

Bael Fruit is obtained from *Ægle Marmelos*, Correa.

The dried half-ripe Fruit was formerly official, but is now omitted.

The fresh half-ripe Fruit is now official in the *Ind.* and *Col. Add.* for use in India and the Eastern Colonies, as is also the Liquid Extract.

Medicinal Properties.—The Fresh Fruit has been much extolled in India for diarrhœa and dysentery, and the Confection prepared in Britain appears to have similar properties. The Dried Fruit is not considered a trustworthy remedy.

If the fresh fruit is not obtainable, the official preparation Extract. Belæ Liquid. answers well in the treatment of dysentery. Generally speaking, Milk is the best vehicle for Bael Fruit and pulp.—*I.M.G.* '05, ii. 264.

CONFECTIO BELÆ RECENTIS (*Squire*).—Prepared from Fresh Fruits imported from India in the Spring months. It retains the odour and flavour of the Fresh Fruit.

Dose.—A teaspoonful.

EXTRACTUM BELÆ LIQUIDUM (*Ind.* and *Col. Add.*).—Made by macerating 4 of bruised Bael Fruit in Water by successive treatments, evaporating the mixed fluids to 3, and when cold adding Alcohol (90 p.c.), *q.s.* to make 4.

Dose.—1 to 2 fl. drm. = 3·6 to 7·2 c.c.

BELLADONNA.

BELLADONNA.

Fr., Belladone; Ger., Belladonna; Ital., Belladonna; Span., Belladona.

The fresh Leaves and Branches of *Atropa Belladonna*, L., as well as the dried Root, are official.

Medicinal Properties.—Anodyne, antispasmodic, mydriatic, antigalactagogue, anhydrotic, and urinary sedative. There is no drug which can compare with it in checking the secretions of milk, sweat, and saliva. It is given for epilepsy, and is one of the best remedies for whooping-cough and for painful spasm of the bladder; in renal colic, dysmenorrhœa and typhlitis; in full and frequent doses for asthma, both as a prophylactic and curative. It is of the utmost value in relieving cardiac pain and distress, palpitation and aortic regurgitation. Useful in typhoid with contracted pupil, and in acute bronchitis it stops profuse secretion. In large or continued doses it causes dilatation of the pupil and dryness of the mouth and throat. For habitual constipation $\frac{1}{6}$ to $\frac{1}{2}$ grain of Extract on rising in the morning. For nocturnal incontinence of urine, 5 to 10 minims of the Tincture, with the same dose of Tinct. of Perchloride of Iron three times a day. Ringer recommends larger doses of Belladonna for this troublesome complaint in children, 10 to 30 minims of the Tincture three times a day; small doses often fail when large doses at once succeed. Useful in loss of tone and irritable state of the generative organs which gives rise to nocturnal emissions, although it has slightly aphrodisiacal properties.

For external uses, see Prescribing Notes.

In the treatment of epilepsy (*L.* '05, i. 710) it is a remedy which should be tried in all cases in which the Bromides have failed. Every now and again cases will be met with in which this drug produces remarkable and persistent arrest of seizures.

Cases of poisoning (*L.* '05, i. 714) by application of Belladonna plaster 8 × 5 applied to the loins for the relief of lumbago.—Recovery. Ointment of 4 grains Atropine Sulphate in the oz. applied for chronic eczema of the nates causes toxic symptoms.—Recovery.

Poisoning by liniment, recovery after use of Strychnine.—*B.M.J.* '07, ii. 1515.

Prescribing Notes.—*The* **Extract** *in pills, also the* **Tincture** *and* **Succus** *are for internal use. The* **Suppository** *is used in prostatitis, cystitis and chordee.* **Bougies** *made with Gelatin base or Oil of Theobroma contain* $\frac{1}{4}$ *to 2 grains of Alcoholic Extract of Belladonna. Externally the* **Liniment** *and* **Compound Liniment** *sprinkled on impermeable Piline are very useful in pleurodynia, lumbago and muscular rheumatism, as is also the* **Chloroform** *preparation alone or mixed with oil. The* **Glycerinum** *as a paint, and the* **Emplastrum,** *are used for sprains, acute synovitis, and to check mammary secretion and prevent inflammation of the breast; both are also an excellent remedy in cardiac pain and palpitation. Extract of Belladonna is a component of many Hospital formulas for* **pills,** *and is prescribed with Aloes, Camphor, Quinine, Rhubarb, Valerian and Zinc Oxide, in doses of* $\frac{1}{8}$ *to* $\frac{1}{4}$ *grain in each pill. In* **Eye Lotions** *2 grains of the green extract to the fl. oz.*

Dose.—Will be found under the respective preparations.

Incompatibles.—Caustic Alkalis, Opium, Strychnine.

Official Preparations.—Extractum Belladonnæ Viride, and Succus Belladonnæ, from the **fresh leaves** and **branches.** Extractum Belladonnæ Liquidum, from the **dried root.** Emplastrum Belladonnæ, Extractum Belladonnæ Alcoholicum, Linimentum Belladonnæ, Tinctura Belladonnæ, and Unguentum Belladonnæ, from the **Liquid Extract,** Suppositoria Belladonnæ, from the **Alcoholic Extract.** Atropine, from **leaves** or **root.**

Not Official.—Chloroformum Belladonnæ, Collodium Belladonnæ, Emplastrum Belladonnæ Viride, Extractum Belladonnæ Foliorum, Extractum Belladonnæ Exsiccatum, Glycerinum Belladonnæ, Linimentum Belladonnæ Compositum, and Ethereal Tincture of Belladonnæ.

Antidotes.—In cases of poisoning by Belladonna, use stomach-tube or give one of the following emetics: 10 grains of Copper Sulphate, 20 grains of Zinc Sulphate, 1 oz. of Ipecacuanha Wine, or hypodermic injection of $\frac{1}{10}$ grain Apomorphine. Give stimulants; inject Pilocarpine; an enema of Coffee. If necessary apply artificial respiration.

BELLADONNÆ FOLIA. Belladonna Leaves.

Fr., Feuilles de Belladone; Ger., Belladonnablätter; Ital., Foglie di Belladonna; Span., Hoja de Belladona.

The fresh Leaves and Branches of *Atropa Belladonna*, L., collected when the plant is in flower.

The Leaves are official in the *U.S.P.* and *P.G.* The *U.S.P.* has introduced a process of assay and requires that they shall yield not less than 0·33 p.c. of mydriatic alkaloids when assayed by this process. Neither *B.P.* nor *P.G.* fixes a standard for the Leaves.

Descriptive Notes. The Pharmacopœia directs that the fresh Leaves and Branches of *Atropa Belladonna* should be collected when the plant is in flower. But the plant often continues to flower long after the fruits are ripe, and consequently the leaves are likely to vary in strength; it would, perhaps, have been better to use the words 'commencing to flower.' The flowering branches are easily recognised by the dull purple bell-shaped flowers, and the ovate entire leaves apparently arranged in pairs, of which one leaf is smaller than the other. The smaller leaf is, however, a bract belonging to the flower, which is placed outside, not in, the axil of the larger leaf. The lower stem leaves are alternate and not in pairs. The leaves vary in size from 3 to 8 inches (7·5 to 20 cm.) in length, and 2 to 3½ inches (5 to 9 cm.) broad and are glabrous or nearly so.

It will be noted that the dried leaves are not official in the *B.P.* although they are in the *U.S.P.* and the *P.G.* The dried leaves are usually brownish-green above and paler beneath, and present, especially on the under surface, when seen under a good lens, minute pale dots or prominences caused by cells filled with sandy crystals of Calcium Oxalate, which do not contract in drying. These crystal cells are easily seen under the microscope in a fragment of the leaf cleared by Chloral Hydrate Solution, as well as the striations of the epidermal cells, which are also characteristic. The dried leaves of *Scopola carniolica*, Jacq., have been offered in commerce when Belladonna leaves were scarce and dear, but they are thinner, darker green, and the small veins are more prominent. The leaves of *Phytolacca decandra*, L., from Bosnia, have also been offered as Belladonna in European commerce. Their upper surface has no hairs, and is of a lighter green, and contains no crystal sand, but acicular raphides, and the epidermal cells are polygonal, not sinuate as in Belladonna.

The *P.G.* leaves are collected in the flowering season.

The percentage of alkaloid varies considerably; a good well-dried sample should contain about 0·5 p.c.

Ph. Ger. maximum single dose, 0·2 gramme; maximum daily dose, 0·6 gramme.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Mex., Norw., Russ., Span., Swed., Swiss and U.S., Leaves; Port., Herb. Not in Hung.

The *Brussels Conference* (1906) uses only the leaf, dried; powdered drug to be used entire.

Tests.—No standard for Belladonna Leaves is given in either *B.P.* or *P.G.*; the *U.S.P.* states that they should yield not less than 0·33 p.c. of mydriatic alkaloids when assayed by the *U.S.P.* process. The *U.S.P.* method of standardisation is as follows:—A weighed quantity of 10 grammes of the leaves in No. 60 powder is allowed to stand for ten minutes in an Erlenmeyer flask with 50 c.c. of a mixture containing 4 parts by volume of Ether and 1 part by volume of Chloroform. A mixture of 2 c.c. of Ammonia Water with 3 c.c. of Water is added and the whole shaken at frequent intervals for one hour. The contents of the flask are then transferred, as far as possible, to a small percolator inserted in a separator containing 6 c.c. of Normal Volumetric Sulphuric Acid Solution diluted with 20 c.c. of Water. After the liquid has passed through, the leaves are packed in the separator, the flask washed first with 10 c.c. and then with several portions of 5 c.c. of the Chloroform-Ether mixture, and these with the remaining contents of the flask transferred to the percolator, the percolation being continued with the Chloroform-Ether mixture until 50 c.c. has been used. The separator is now securely stoppered, agitated for one minute, the fluids allowed to separate clear, and the acid aqueous solution removed to a second separator. A further quantity of 10 c.c. of a mixture of Normal Volumetric Sulphuric Acid Solution of the same strength as that previously used is added, the contents well shaken, allowed to separate and the acid aqueous portion again drawn off into the second separator, and this operation is repeated. To the mixed acid liquids in the second separator is added a small piece of red Litmus paper and sufficient Ammonia Water to render the fluid distinctly alkaline, the mixture being then shaken with two successive quantities of 15 c.c. and one of 5 c.c. of Chloroform. The Chloroform solutions are separated, collected, and evaporated in a beaker, the residue dissolved in 3 c.c. of Ether and the Ether allowed to evaporate. The residue is dissolved in 3 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution, 5 drops of Cochineal Test Solution added and the excess of Acid titrated with Fiftieth-normal Volumetric Potassium Hydroxide Solution. The number of c.c. of Fiftieth-normal Volumetric Potassium Hydroxide Solution required is divided by 5, the quotient subtracted from 3 and the product multiplied by 0·0287 and again multiplied by 10, giving the percentage of total mydriatic alkaloids in the leaves.

EXTRACTUM BELLADONNÆ VIRIDE. Green Extract of Belladonna.

Heat the expressed Juice of the Fresh Leaves and Young Branches to 54·4° C. (130° F.), and collect on a filter the green colouring matter which separates; heat the filtrate to 93·3° C. (200° F.) and filter. Evaporate the clear liquid to an Extract, returning the green colouring matter towards the end of the process and completing the operation at 60° C. (140° F.).

100 lb. of Herb yielded 56 lb. of Juice, or nearly 4 lb. Extract.

100 lb. Leaves, when dried, weighed 16 lb.

An estimation of the alkaloids contained in four samples of Extract of Belladonna, prepared in 1885 by different makers, gave 0·94 p.c., 1·17 p.c., 1·11 p.c., and 0·73 p.c. The following samples in good condition were examined at the same time: 1880—1·26 p.c., 1·22 p.c.; 1881—1·16 p.c., 1·21 p.c.; 1884—1·21 p.c.

A sample of 1892 Extract yielded 1·7 p.c. of alkaloids.

An average sample of Extract contains rather over 1 p.c. of alkaloids.

Dose.—$\frac{1}{4}$ to 1 grain = 0·016 to 0·06 gramme.

Ph. Ger. maximum single dose, 0·05 gramme; maximum daily dose, 0·15 gramme.

Foreign Pharmacopœias.—Official in Austr., Belg. and Mex., Alcoholic from the **leaves**; Mex. has also Alcoholic extract from the **root,** and a Fluid Extract 1 in 1; Dan., made from **leaves** with weak Spirit; Dutch, Alcoholic from **leaves;** Fr., Alcoholic from **leaves** and **seeds;** Ger., made with Water and Spirit from **leaves;** Hung. and Ital., Alcoholic from **root;** Norw. and Swed., Alcoholic from **leaves;** Port., aqueous from **dried leaves,** Alcoholic from **fresh herb** and Alcoholic extract purified by Alcohol; Russ., made from **leaves** with Water and Spirit; Span., aqueous from **fresh leaves;** also Alcoholic from **dried leaves;** U.S., an Alcoholic extract from the powder of the **leaf,** also **Fluid Extract** of the **root.**

Extractum Belladonnæ Foliorum (*U.S.*).—Belladonna Leaves exhausted with a mixture of Alcohol (95 p.c.) 2, and Water 1, evaporated to an extract and adjusted with powdered Sugar of Milk to contain 1·4 p.c. of mydriatic alkaloids.

Extractum Belladonnæ Exsiccatum. *Syn.* Extractum Belladonnæ Folii Exsiccatum. Belladonna Leaves exhausted with Alcohol (70 p.c.) and adjusted with Powdered Belladonna Leaves so as to finally form a powder containing 1 p.c. of alkaloids.—*B.P.C.*

The *Brussels Conference* (1906) prepares a solid extract (containing about 10 p.c. of Water) by means of Alcohol (70 p.c).

The Belg., Dan., Fr. and Swiss Ph. adopt this standard.

Tests.—Green Extract of Belladonna, *B.P.*, is not a standardised preparation. The official alcoholic Extract is made from the standardised Fluid Extract, and is required to contain 1 p.c. of the alkaloids of Belladonna Root. The method of procedure adopted by the *U.S.P.* for the standardisation of the Extract from the leaves is as follows:—A weighed quantity of 5 grammes of the Extract is dissolved in a mixture of 5 c.c. of Alcohol (94·9 p.c.), 10 c.c. of Water, 2 c.c. of Ammonia Water, and 20 c.c. of Chloroform, and transferred to a separator, using a little Alcohol (94·9 p.c.) to wash out the vessel in which the Extract was dissolved. After the contents of the separator have been well shaken for half a minute they are allowed to separate, the chloroformic solution is removed to another separator, and the contents of the first separator are shaken with another 10 c.c. of Chloroform. After a similar period of shaking and allowing the liquids to separate, the chloroformic solution is transferred to the second separator. This process is repeated with a further quantity of 10 c.c. of Chloroform. The alkaloids are then extracted from the mixed chloroformic solutions by shaking for half a minute with 5 c.c. of Normal Volumetric Sulphuric Acid Solution and 10 c.c. of Water. The chloroformic layer is removed and again shaken for half a minute with 1 c.c. of Normal Volumetric Sulphuric Acid Solution and 10 c.c. of Water, the liquids allowed to separate, and the chloroformic layer removed and rejected. The mixed acid aqueous solutions are filtered through a plug of Cotton-wool, the vessels in which they were contained being washed with about 10 c.c. of Water. After the addition of 15 c.c. of Chloroform and sufficient Ammonia Water to produce a distinctly alkaline reaction, the contents of the separator are shaken for half a minute, allowed to separate, and the chloroformic layer is drawn off into a beaker. The shakings are repeated, using two separate portions each of 10 c.c. of Chloroform, the mixed chloroformic liquids are evaporated to dryness, the residue is dissolved in 3 c.c. of Ether and again evaporated. It is now dissolved in 5 c.c. of Deci-normal Volumetric Sulphuric Acid Solution, 5 drops of Cochineal or Iodeosin Test-solution added, and the excess of Sulphuric Acid is titrated back with Fiftieth-normal Volumetric Potassium Hydroxide Solution. The number of c.c. of Fiftieth-normal Volumetric Potassium Hydroxide Solution used is divided by 5, and the quotient is subtracted from 5; the remainder is multiplied first by 0·0287 and then by 20, which gives the percentage of mydriatic alkaloids.

The process of the *P.G.* is as follows:—A weighed quantity of 2 grammes of the Extract is dissolved in 5 grammes of Water and 5 grammes of Absolute Alcohol. 50 grammes of Ether and 20 grammes of Chloroform are added to the solution, and after brisk agitation 10 c.c. of a 1 in 3 Sodium Carbonate Solution. After the mixture has been allowed to stand for one hour, with frequent intervals of brisk shaking, 50 c.c. of the clear Chloroform-Ether solution is filtered through a dry, well-covered filter into a flask, and one-half distilled. The remaining Chloroform-Ether solution is transferred to a separator, the flask being washed out with three separate quantities each of 5 c.c. Ether, and the mixed fluids thoroughly shaken with 20 c.c. of Hundredth-normal Volumetric Hydrochloric Acid Solution. When the liquids have completely cleared, and after the addition of sufficient Ether to cause the Chloroform-Ether solution to float on the surface of the acid fluid, the latter is filtered through a small filter paper moistened with Water into a flask of white glass holding about 200 c.c. The Chloroform-Ether solution is shaken with three successive quantities each of 10 c.c. of Water, these being passed through the same filter, the filter washed with Water, and the filtrate and washings diluted to about 100 c.c. Sufficient Ether to form a layer of 1 cm. is added, 5 drops of a 1 in 500 alcoholic Iodeosin solution, and Hundredth-normal Volumetric Potassium Hydroxide Solution until the lower aqueous layer acquires a pale reddish coloration, the liquids being vigorously shaken after each addition. Not more than 13·0 c.c. of Hundredth-normal Volumetric Potassium

Hydroxide Solution should be required. The number of c.c. of Hundredth-normal Volumetric Potassium Hydroxide Solution required, subtracted from 20, multiplied first by 0·0028927, then by 100, and divided by 1·333, will give the percentage by weight of mydriatic alkaloids present in the Extract, which should amount to not less than 1·5 p.c.

The quantity chosen for the assay is a somewhat inconvenient one, the instructions given in the process necessitating the employment of 1·333 as a factor in calculating the percentage yield of alkaloid; the point has already been referred to in Merck's Annual Report for the year 1900. A stock of Chloroform-Ether mixture should be employed instead of a freshly-prepared mixture of Chloroform and Ether, an appreciable rise of temperature ensuing when the liquids are mixed in the indicated proportions. Great attention to the cleanliness of all the vessels employed is also necessary in dealing with Hundredth-normal Volumetric Solutions.

SUCCUS BELLADONNÆ. Juice of Belladonna.

Add 1 of Alcohol (90 p.c.) to 3 of the expressed Juice from the Fresh Leaves and Young Branches.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Belladonna Juice, which would yield an Extract containing 1 p.c. of alkaloid, would form a Succus of about 0·05 p.c., which is also the strength of the Tincture.

BELLADONNÆ RADIX. Belladonna Root.

Fr., Racine de Belladone; Ger., Belladonnawurzel; Ital., Radice di Belladonna; Span., Raiz de Belladona.

The Root of *Atropa Belladonna*, collected in the autumn and dried.

A good parcel of Roots should average 0·5 p.c. of alkaloid, but occasional bales are found averaging 0·7 to 0·8 p.c.

Foreign Pharmacopœias.—Official in Austr., Hung., Ital., Mex., Port., Span., Swiss and U.S. Not in Belg., Dan., Dutch, Fr., Ger., Jap., Norw., Russ. or Swed.

Descriptive Notes.—The Belladonna root of commerce is either of English or European origin. That prepared in this country is usually derived from the cultivated plant, the roots of which are dug up every third and fourth year after having furnished Belladonna leaves during that period. It varies in quality, some samples consisting largely of the woody rootstock or underground stem crowning the roots, distinguished by its radiate woody zone, and by being more or less hollow; others consist almost entirely of the true root with occasionally pieces of the horizontal underground stems or suckers which show traces of leaf scars and buds at intervals. The true root, which is the official part, is cylindrical; it may vary considerably in size, but those of medium thickness are to be preferred. It is stated officially to be $\frac{3}{8}$ to $\frac{3}{4}$ in. (9 to 19 mm.) in diameter and 6 to 12 in. (15 to 30 cm.) or more in length. *Vogl* gives it as about 10 cm. long, and 1 to 2 cm. thick. *Hanbury* and *Fluckiger* recommend roots which are not thicker than the finger. It is of a pale brownish colour with occasional short transverse scars and is finely wrinkled longitudinally, and the surface is easily abraded with the finger-nail showing the white starchy tissues beneath. The central portion, clearly defined by the darker cambium ring, is not radiate in structure, but the vascular bundles and vessels are small and scattered irregularly, although more numerous near the cambium. Under the microscope the scattered parenchymatous cells, filled with sandy crystals of Calcium Oxalate, and the starch grains usually in groups of 2 to 3, but rounded when free, form distinctive characters. The root is sometimes met with of darker colour internally and harder, due to slight charring during drying. From Germany it is sometimes imported in carefully dried thin longitudinal slices, so that the official characteristics are not easily seen, and dependence must then be placed on the presence of the sandy raphides, and the form and size of the starch granules. The *U.S.P.* test of a 0·5 percentage of mydriatic alkaloids is not given in the *B.P.* but would be useful, especially for the sliced root.

The 'root' of *Scopola Japonica*, Max., sometimes offered as Japanese Belladonna and that of *S. Carniolica*, Jacq., are both characterised by being prostrate rhizomes with numerous closely placed circular stem scars on the upper surface. The true roots, of which there are usually few present, are smaller than Belladonna root and only 2 to 4 inches (5 to 10 cm.) long and tapering, and the epidermis is not easily abraded by the nail. Recently Belladonna root imported from Austria has been found to be largely adulterated with the root of *Phytolacca decandra*, L., which though similar in colour is easily recognised by the concentric rings of woody tissue. It is a dangerous adulterant, as it is irritant, acrid and emetic.

Tests.—The *B.P.* does not include a process for the assay of Belladonna Root. The *U.S.P.* gives a process for the determination and requires that it shall yield not less than 0·45 p.c. of mydriatic alkaloids; with the exception that 10 grammes of the root in No. 60 powder are used in the place of 10 grammes of the Leaves, the process is essentially that described under Belladonna Leaves.

The root is not official in the *P.G.*, but the greater part of the root used in this country comes from Germany.

EMPLASTRUM BELLADONNÆ. Belladonna Plaster.

4 of Liquid Extract of Belladonna evaporated to 1 and mixed with 5 of Resin Plaster.

Contains 0·5 p.c. of alkaloids.

This Plaster can be obtained spread on calico, linen, or leather; it is also supplied in rubber combination, spread on felt or kid, plain or porous.

Foreign Pharmacopœias.—Official in Fr., Extract 1 in 4; Mex., Belladonna Leaves 20, Alcohol (90 p.c.) 10, Ammonia 1, Yellow Wax 30, Turpentine 25, Colophony 25; Port., Alcoholic Extract 1, Lead Plaster 9; Span., Extract about 1 in 5; Swiss, Belladonna extract 1, Elemi 1, Colophony 2, Adhesive Plaster 6; U.S., Extract of Leaves 1, Adhesive Plaster 2½; Mex., from the leaves with Alcohol. Not in the others.

EMPLASTRUM BELLADONNÆ (*U.S.*).—Standardised Alcoholic Extract of Belladonna Leaves 3, Adhesive Plaster 7. Contains not less than 0·38 p.c. nor more than 0·42 p.c. of mydriatic alkaloids.

EMPLASTRUM BELLADONNÆ VIRIDE (*B.P.C.*).—Green Extract of Belladonna 1, treated with 4 of Alcohol (90 p.c.), evaporation of the Alcohol, and admixture of the residue with Resin Plaster *q.s.* to make 4.

It is not standardised and even when made from herb of good quality will only be about half the strength of the official plaster.

Tests.—The Emplastrum Belladonnæ of the *B.P.* is prepared with the official standardised Fluid Extract of Belladonna, and is officially stated to contain 0·5 p.c. of the alkaloids of the root. The figure is arrived at by calculation, but no process is given by which the presence of the requisite amount of alkaloids may be ensured. One or two processes have been recommended (*P.J.* '99, ii. 110, 114, 180; *C.D.* '99, ii. 214, 227, 331). One of the best and most generally employed is that suggested by Bird (*P.J.* '99, ii. 146; *Analyst* '99, 175), which is based upon the disintegration of the plaster by Chloroform and Acetic Acid, the removal of the Lead as an insoluble Sulphate, the extraction of the impure alkaloids from the filtered aqueous acid liquid by treatment with Ammonia Solution and Chloroform, and their final purification as in the *B.P.* process for Extractum Belladonnæ Liquidum.

The details of the process are as follows:—A weighed quantity of 15 grammes of the Plaster is gently warmed with 35 c.c. of Chloroform and 5 c.c. of Glacial Acetic Acid until dissolved, and after the addition of a mixture of 35 c.c. of a 1 in 12 dilute Sulphuric Acid Solution and 40 c.c. of Water is again gently warmed and filtered under pressure through a Buchner's filter. The cake of insoluble Lead Sulphate is disintegrated, warmed with a mixture of 10 c.c. of Chloroform, 5 c.c. of dilute Sulphuric Acid, and 10 c.c. of Water, and again filtered. The mixed filtrates are transferred to a separator, the chloroformic layer is removed and washed with two successive quantities of a mixture of 1 c.c. of dilute Sulphuric Acid and 4 c.c. of hot Water, the washings being returned to the aqueous portion. A measured quantity of 20 c.c. of Chloroform and a decided excess of Ammonia Solution are added to the mixed acid aqueous solutions, the mixture gently warmed and agitated. The chloroformic solution is drawn off, and to ensure the complete extraction of the alkaloids the agitation is twice repeated with 10 c.c. of Chloroform. The chloroformic solutions are in each instance separated, mixed and shaken with 5 c.c. of a mixture of 1 in 12 dilute Sulphuric Acid Solution and twice its volume of warm Water. When separation is complete the chloroformic layer is removed and again treated with 5 c.c. of the same mixture as above, the chloroformic layer being again removed, the acid aqueous liquids mixed together and washed with Chloroform, using about 3 c.c. Sufficient Ammonia Solution is then added to form a distinct excess, and the liberated alkaloids are then removed from the mixture by shaking three times in succession with 10 c.c. of Chloroform; the mixed chloroformic solutions, after washing with 5 c.c. of Water containing one drop of Ammonia Solution, are evaporated to dryness on a water-bath in a tared basin, and the residue dried at a temperature below 100° C. (212° F.). The amount of alkaloid in this residue may then be determined volumetrically by dissolving in 10 c.c. of Deci-normal Volumetric Hydrochloric Acid Solution and titrating the excess of acid with Centi-normal Volumetric Sodium Hydroxide Solution, using Tincture of Cochineal, Methyl Orange, Hæmatoxylin, or Iodeosin Solution as an indicator of neutrality. The number of c.c. of Centi-normal Volumetric Sodium Hydroxide Solution used, deducted from 100, the remainder multiplied first by 0·00287, then by 20, and divided by 3, will give the percentage by weight of the alkaloids of Belladonna Root present in the Plaster.

The process of assay adopted by the *U.S.P.* is essentially as follows:—A weighed quantity of 10 grammes of the Plaster in strips is macerated with a mixture of 50 c.c. of Chloroform and 3 c.c. of Ammonia Water, the mixture being stirred until the Plaster is completely removed from the cloth, when the Chloroform is transferred to another vessel, the cloth being washed with a mixture of 25 c.c. of Chloroform and 1 c.c. of Ammonia Water, if necessary with a further quantity of 25 c.c. of Chloroform, the chloroformic solutions in each case being removed and added to the main quantity. The cloth is dried at a low temperature, cooled and weighed, its weight being deducted from the original weight of Plaster. A measured quantity of Alcohol (94·9 p.c.) equivalent to four-fifths of its volume is added to the mixed chloroformic solution, the liquid is gently stirred and allowed to rest until the rubber separates. The supernatant liquid is transferred to a separator and agitated for two minutes with 20 c.c. of a solution prepared by diluting 40 c.c. of Normal Volumetric Sulphuric Acid Solution with 60 c.c. of Water. After separation, the chloroformic liquid is drawn off and again shaken for two minutes with 10 c.c. of an acid solution of the same strength, the separated acid liquid mixed with the main quantity, the treatment with this acid solution continued until the shakings fail to give a reaction with Mayer's reagent (Mercuric Potassium Iodide Test Solution). Sufficient Ammonia Water is added to the mixed aqueous acid liquids to ensure an alkaline reaction, and the liberated alkaloids are removed by shaking with Chloroform, using first 25 c.c., then 15 c.c., and finally 10 c.c. The chloroformic solutions are separated, mixed, and the Chloroform evaporated off on a water-bath. A slight excess of Deci-normal Volumetric Sulphuric Acid Solution is added to the alkaloidal residue, the actual amount added being carefully noted, 10 drops of Chloroform are added, the liquids rotated, and the Chloroform evaporated by means of a water-bath. The excess of acid is titrated with Fiftieth-normal Volumetric Potassium Hydroxide Solution, using Cochineal Test-solution as an indicator of neutrality. The number of c.c. of Fiftieth-normal Volumetric Potassium Hydroxide Solution used divided by 5, the quotient subtracted from the number of c.c. of Deci-normal Volumetric Sulphuric Acid Solution first used, divided by the number of grammes of Plaster separated from the cloth, multiplied first by 0·0287 and then by 100, gives the percentage of mydriatic alkaloids present in the Plaster. The *U.S.P.* requires that it should contain not less than 0·38 p.c. nor more than 0·42 p.c. by weight of such alkaloids.

EXTRACTUM BELLADONNÆ ALCOHOLICUM. Alcoholic Extract of Belladonna.

Prepared from the Liquid Extract of Belladonna, and readjusted by means of Milk Sugar, so as to contain 1 p.c. of alkaloids.

Dose.—¼ to 1 grain = 0·016 to 0·06 gramme.

Foreign Pharmacopœias compared under Extractum Viride.

EXTRACTUM BELLADONNÆ LIQUIDUM. Liquid Extract of Belladonna.

A fluid prepared from Belladonna Root in No. 20 powder, with a mixture of 7 volumes of Alcohol (90 p.c.) and 1 volume of Distilled Water, by repercolation, and standardised to contain 0·75 p.c. of alkaloids = ¾ grain in 110 minims.

A standardised Liquid Extract of Belladonna is official in the *B.P.*; the *U.S.P.* Fluid Extract is prepared with the official standard Belladonna Root in No. 60 powder and contains 0·4 p.c. w/v of mydriatic alkaloids, the *B.P.* from a root which is not standardised, in No. 20 powder. The *P.G.* does not include a fluid extract.

Commercial samples of this liquid extract vary enormously in colour and consistence, consequently all preparations made from the liquid extract will also have a tendency to vary in colour, and may necessitate explanations to physicians and patients.

Tests.—Liquid Extract of Belladonna has a sp. gr. of from 0·896 to 1·022, and may contain from 6·2 to 26·2 p.c. w/v of total solids and about 70 p.c. w/v of Absolute Alcohol. The *B.P.* process of assay consists in extracting the alkaloids from 10 c.c. of the liquid extract diluted with 5 times its volume of Water, by adding a decided excess of Ammonia Solution, and shaking out with three successive quantities each of 10 c.c. of Chloroform. The chloroformic layers are separated in each instance and the alkaloids are removed from the mixed chloroformic solutions by shaking with a mixture of 5 c.c. of Diluted Sulphuric Acid mixed with twice its volume of warm Water, the operation being repeated to ensure their complete extraction from the Chloroform. The mixed acid liquids are shaken with a small quantity (3 c.c.) of Chloroform, the latter separated and rejected, an excess of Ammonia Solution is added, and the liberated alkaloids are shaken out with two successive quantities each of 10 c.c. of Chloroform. The mixed chloroformic solutions, after being shaken with a little Water (5 c.c.) made faintly alkaline by the addition of one drop of Ammonia Solution, are separated and evaporated, the residue being subsequently weighed after drying at a temperature under 100° C. (212° F.). The actual amount of alkaloid present is then determined volumetrically by dissolving this residue in 10 c.c. of Deci-normal Volumetric Hydrochloric Acid Solution, the excess of acid being determined by titration with Centi-normal Volumetric Sodium Hydroxide Solution, Tincture of Cochineal being used as an indicator of neutrality. 10 c.c. of Deci-normal Volumetric

Hydrochloric Acid Solution being equivalent to 100 c.c. of Centi-normal Volumetric Hydrochloric Acid Solution, if the number of c.c. of Centi-normal Volumetric Sodium Hydroxide Solution required to restore neutrality be deducted from 100 and the product multiplied first by 0·00287 and then by 10, the result will be the weight in grammes of alkaloids present in 100 c.c. of the Fluid Extract. The *B.P.* requires 0·75 p.c. w/v of alkaloids. This process has been subjected to prolonged and severe criticism, and numerous processes have been suggested to fill its place. The obstinate emulsions formed in the very first stages of the process are the worst features. Of the many modifications suggested for the removal of the defects attending the *B.P.* method that of Bird's is probably the most generally used. It is rapid in execution, is free from emulsification, it extracts practically the whole of the alkaloids in a pure condition from any sample of fluid extract, and the results are about from 5 to 6 p.c. higher than by the *B.P.* process. A measured quantity of 10 c.c. is mixed with 2 c.c. strong Ammonia Solution and shaken vigorously with 16 c.c. of a mixture of 3 volumes of Amylic Alcohol, 1 volume of Chloroform and 4 volumes of Ether. The ethereal layer is separated, washed in a second separator with 4 c.c. of Water, added in two portions. The washings are returned to the first separator and the mixed fluids again shaken with 8 c.c. of the Amylic-chloroform-ether mixture. The ethereal layer is transferred to the second separator and again washed with 1 c.c. of Water, separated and returned to the first separator. It is extracted a third and a fourth time with 7 c.c. of the above-mentioned mixture and washed in the second separator with 1 c.c. of Water. The mixed ethereal liquids are now extracted four times, first with a mixture of 4 c.c. of Normal Volumetric Sulphuric Acid Solution and 6 c.c. of Water, and then three times in succession with 3 c.c. of Water. Sufficient Ammonia Solution is added to the mixed acid liquids to render them distinctly alkaline in reaction, and they are shaken out four times with Chloroform, using first 10 c.c. and then three successive quantities of 5 c.c. The mixed chloroformic solutions are evaporated on a water-bath at a temperature below 100° C. (212° F.) to a constant weight, and titrated in the usual manner. Bird has pointed out (*P.J.* [4] 8, 432) that Methyl Orange Solution gives good results as an indicator of neutrality for Belladonna alkaloids. He states that the difference between the results by weight and titration should not exceed 3 or 4 p.c.

The method adopted by the *U.S.P.* is essentially as follows:—A measured quantity of 10 c.c. of the fluid extract is diluted with an equal volume of Water and shaken with 20 c.c. of Chloroform and 2 c.c. of Ammonia Solution. The chloroformic layer is removed to a second separator, the treatment being continued with two portions each of 10 c.c. of Chloroform. The mixed chloroformic solutions are now shaken for one minute with 8 c.c. of Normal Volumetric Sulphuric Acid Solution and 20 c.c. of Water. The chloroformic layer is removed and rejected, the aqueous acid liquid is filtered into a clean separator, the first separator and filter being washed with 10 c.c. of Water and the washings added to the main quantity. After the addition of 4 c.c. of Ammonia Solution the latter is well shaken with 20 c.c. of Chloroform, the chloroformic layer is separated and the extraction repeated with two separate portions of 10 c.c. of Chloroform. The mixed chloroformic solutions are evaporated on a water-bath and the residue heated till perfectly dry. The residue is then dissolved in 5 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution, and the excess of acid titrated with Fiftieth-normal Volumetric Potassium Hydroxide Solution, 5 drops of Cochineal or of Iodeosin Test-solution being employed as an indicator of neutrality. If the number of c.c. of Fiftieth-normal Volumetric Potassium Hydroxide Solution required to neutralise the excess of acid be divided by 5, the quotient subtracted from 5, and then multiplied by 0·0287 and by 10, the product will be the weight in grammes of mydriatic alkaloids contained in 100 c.c. of the Fluid Extract. The opening stages of the *U.S.P.* process are very similar to those of the *B.P.*, and it has been remarked (*P.J.* '07, i. 393) that it is rather surprising that, after the somewhat harsh criticism to which the process of the *B.P.* has been subjected, the revisers of the *U.S.P.* should adopt a similar one, but on the whole comparatively little difficulty was experienced with the *U.S.P.* process, and subsequent experience has shown that if carried out to the letter sharp separations will be obtained. It must not, however, be too hastily assumed that the process is faultless and it is finally concluded that Bird's modification of the *B.P.* process is more suited to the requirements of pharmacists.

In the author's laboratory the *U.S.P.* process has given satisfactory results and is certainly considered preferable to the *B.P.* process. No emulsification occurred in the earlier stages of the process, the extracted alkaloid was of good appearance and free from dark colour. Although not specifically instructed to do so in the *U.S.P.* monograph, the residues were in nearly all cases weighed when constant, and the difference between the gravimetric and the volumetric estimations never amounted to more than from 3 to 4 p.c.

LINIMENTUM BELLADONNÆ. Liniment of Belladonna.

Liquid Extract of Belladonna, 10; Camphor, 1; Distilled Water, 2; Alcohol (90 p.c.), *q.s.* to yield 20.

Prescribing Notes.—*Prescribed with equal parts of Soap Liniment or Compound Camphor Liniment. Does not mix readily with fixed Oils. When an oily liniment is required it is better to order the Chloroform of Belladonna mixed with Olive or Almond Oil.*

Foreign Pharmacopœias.—Official in U.S., Camphor 1, Fluid Extract of Belladonna to make 20; Mex. (Aceite de Belladonna), Dried Leaves 1, Sesame Oil 10. Not in the others.

SUPPOSITORIA BELLADONNÆ. Belladonna Suppositories.

Made with alcoholic Extract of Belladonna and Oil of Theobroma. Each Suppository contains $1\frac{1}{2}$ grain of Extract = about $\frac{1}{64}$ grain of alkaloid.

TINCTURA BELLADONNÆ. TINCTURE OF BELLADONNA.

1 of Liquid Extract of Belladonna diluted with Alcohol (60 p.c.) to yield 15.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Fr., Span., Swiss and U.S., 1 in 10; Ital., Mex. and Port., 1 in 5; Russ., 1 in 12. Port., also 1 in 1, from leaves. All by weight except U.S. Not in the others.

The Brussels Conference (1906) adopts a strength of 10 p.c., and prepares it by percolation with Alcohol (70 p.c.) The Belg., Fr. and Swiss Ph. adopt this standard.

Tests.—Tincture of Belladonna, *B.P.*, is prepared from the standardised Fluid Extract and is officially required to yield not less than 0·048 p.c. nor more than 0·052 p.c. w/v of alkaloid. The word 'alkaloid' is presumably intended to read 'alkaloids.' The Fluid Extract from which it is prepared is officially required to yield a fixed percentage of alkaloids. A measured quantity of 100 c.c. is employed in the process of assay. The Alcohol is removed by evaporating to a low bulk and the resultant product is assayed by the process described under Extractum Belladonnæ Liquidum. In calculating the result of the titration the number of c.c. of Centi-normal Volumetric Sodium Hydroxide Solution used should be deducted from 100 and the product multiplied by 0·00287, which will give the weight in grammes of alkaloids present in 100 c.c. of the Tincture.

The *U.S.P.* evaporates 100 c.c. of the Tincture until it is reduced to about one-tenth of its volume, adds sufficient Alcohol (94·9 p.c.) to redissolve any substance which has separated out and employs the process mentioned under Extractum Belladonnæ Fluidum. The number of c.c. of Fiftieth-normal Volumetric Potassium Hydroxide Solution required to restore neutrality divided by 5, subtracted from 5, and multiplied by 0·0287, gives the weight in grammes of mydriatic alkaloids present in 100 c.c. of the Tincture; it should be 0·3 p.c. w/v.

The specific gravity of the Tincture varies according to the specific gravity of the liquid extract with which it is prepared, it is usually about 0·910; it contains about 1 p.c. w/v of total solids, and about 60 p.c. w/v of Absolute Alcohol.

UNGUENTUM BELLADONNÆ. BELLADONNA OINTMENT.

8 of Liquid Extract of Belladonna evaporated to 1, and mixed with 9 of Benzoated Lard.

Contains 0·6 p.c. of Alkaloid.

Foreign Pharmacopœias.—Official in Belg. and U.S., Extract 1 in 10; Fr. (Pommade Belladonée), Extract 3, Glycerin 2, Benzoinated Lard 25; Ital. (Pomata di Belladonna), Extract 10, Glycerin 5, Benzoated Lard 85; Mex. (Pomada de extracto de Belladona), Extract 1, Lard 7½; Port. (Pomada de Belladona), aqueous Extract 1, Lard 9; (Pomada de Belladona Forte), Alcoholic Extract 1, Lard 9; Span. (Pomada de Belladona), Extract 1½ in 10. Not in the others.

Not Official.

CHLOROFORMUM BELLADONNÆ.—Belladonna Root, in powder, 20; percolate with Chloroform *q.s.* to yield 20.—*Squire's Companion* 1864.

Applied with equal parts of Camphor Liniment or Olive Oil, for painful rheumatism.

It is well known that this preparation only extracts about half of the total alkaloids. By mixing the Root (in No. 40 powder) with Slaked Lime and powdered Carbonate of Ammonium, four-fifths of the alkaloid will appear in the first 1 in 1 percolate.—*Squire's Companion* 1894.

Belladonna Root, in No. 60 powder, 100; Solution of Ammonia, 25; Absolute Alcohol *q.s.*; Chloroform *q.s.* Moisten the Belladonna root with the solution of Ammonia and set aside for 24 hours. Transfer to a percolator and percolate with a menstruum consisting of 1 of Absolute Alcohol to 7 of Chloroform until 100 of percolate is obtained.—*B.P.C.*

The above formula is the outcome of a series of experiments undertaken by R. Wright; full particulars will be found in *Y.B.P.* '03, 589; *P.J.* '03, ii. 153; *C.D.* '03, ii. 246; *Y.B.P.* '07, 367, 371; *P.J.* '07, ii. 106; *C.D.* '07, ii. 171.

Samples of Chloroform of Belladonna were prepared by the *Companion* 1894 process, and by that recommended by the *B.P.C.* That prepared by the *Companion* 1894 process had a specific gravity of 1·476, it contained 3·11 p.c. w/v of total solids, and when assayed according to an adaptation of the *U.S.P.* process for the assay of Belladonna Root yielded gravimetrically 0·25 p.c. w/v of alkaloids and volumetrically 0·236 p.c. w/v of alkaloids, calculated as Atropine. When assayed by the process recommended by Farr and Wright it yielded gravimetrically 0·24 p.c. w/v of alkaloids and volumetrically 0·235 p.c. w/v of alkaloids, calculated as Atropine. This latter process gave considerable trouble in its manipulation, and emulsions were produced which obstinately refused to separate even on prolonged standing, and clear separations had to be produced mechanically. The adaptation of the *U.S.P.* process of assay worked admirably, it yielded the alkaloids practically free from colour and in a pure condition, no trouble was experienced through emulsification. The *B.P.C.* product had a specific gravity of 1·419; it contained 3·79 p.c. w/v of total solids, and showed when assayed by a method founded on a modification of the *U.S.P.* process for the assay of Belladonna Root, gravimetrically 0·38 p.c. w/v of alkaloids, volumetrically 0·365 p.c. w/v of alkaloids, calculated as Atropine. By the process recommended by Farr and Wright it indicated gravimetrically 0·22 p.c. w/v of alkaloids, and volumetrically 0·209 p.c. w/v of alkaloids, calculated as Atropine.

COLLODIUM BELLADONNÆ. *Syn.* EMPLASTRUM BELLADONNÆ FLUIDUM.—Liquid Extract of Belladonna, 50; Canada Turpentine, 4; Castor Oil, 2; and Ether, 40. Mix and digest for 12 hours, filter and add Camphor, 1·5; Pyroxylin, 2·5; and Ether (sp. gr. 0·720), *q.s.* to make 100.—*B.P.C.*

This is a modification of the formula given in *B.P.C. Formulary* 1901.

GLYCERINUM BELLADONNÆ.—Green Extract of Belladonna, 8; boiling Distilled Water, 1; Glycerin, to 16.—*B.P.C. Formulary* 1901.

This has been incorporated in the *B.P.C.*

This is practically the same strength as *London* and *Middlesex*; it also appears in other Hospital Pharmacopœias, with varying quantities.

Official in Port., 1 Extract in 10.

LINIMENTUM BELLADONNÆ COMP.—Liniment of Belladonna, 7; Chloroform of Belladonna, 1; mix. For application to the loins in lumbago it should be sprinkled on impermeable piline (not *spongio piline*), and firmly pressed with the hands on the part for five minutes to ensure perfect contact; it should then be kept on for at least 10 or 12 hours.

Peter Squire, who suffered much from lumbago, found this more effectual and much more convenient than Belladonna Plasters.

LINIMENTUM BELLADONNÆ CUM CHLOROFORMO.—Chloroform, 12·50; Liniment of Belladonna, *q.s.* to make 100.—*B.P.C.*

ETHEREAL TINCTURE OF BELLADONNA (*Sawyer*).—Substitute Pure Ether for Rectified Spirit in the Liniment of *B.P.* '85.—*L.* '90, ii. 67.

Not Official.

BENZIN.

PETROLEUM BENZIN. PETROLEUM ETHER.

A purified distillate from American Petroleum. It is a transparent, colourless, highly inflammable liquid, possessing a characteristic odour.

It should be preserved in well-stoppered bottles and in a cool atmosphere. It forms a highly explosive mixture with air.

Solubility.—Insoluble in Water, about 1 in 6 of Alcohol (90 p.c.); readily soluble in Ether, Chloroform, fixed and volatile Oils.

Medicinal Properties.—Used in seborrhœa, in acne, and generally for the purpose of dissolving off grease from the skin. It is highly inflammable, and must not be used near a fire or naked flame.

Foreign Pharmacopœias.—Official in Ger., Jap., Russ., Swiss and U.S. U.S. has also Benzinum Purificatum.

Tests.—The distinguishing tests for Benzin are its peculiar odour; the specific gravity which should be 0·670 to 0·675; the boiling point which should be from 45° to 60° C. (113° to 140° F.); and that it does not produce the odour of Nitro-benzene when treated with ten times its volume of a mixture of 4 volumes of Sulphuric Acid and 1 volume of Nitric Acid.

Petroleum Ether sp. gr. 0·716, generally known under the name of **Petrol**, is used extensively for the internal combustion engines of motor vehicles.

BENZINUM PURIFICATUM.—Potassium Permanganate, 1; Sodium Hydroxide, 0·2; Sulphuric Acid, 6; Petroleum Benzin, 100; Water *q.s.* Add the Acid to 55 of Distilled Water and when cold pour into a bottle having the capacity of about 200. Add 0·8 of Potassium Permanganate, agitate till dissolved, then add the Petroleum Benzin in four portions, shaking the liquid after each addition, allow the liquids to remain in contact for 24 hours, shaking the bottle at frequent intervals, then decant the Petroleum Benzin, and having dissolved 0·2 gramme of Potassium Permanganate in 24 of Water, in which the Sodium Hydroxide has previously been dissolved, mix and agitate frequently, then decant, repeat the washing with Water, and again decant the Petroleum Benzin.—*U.S.P.*

This has been incorporated in the *B.P.C.*

BENZOINUM.

BENZOIN.

FR., BENJOIN; GER., BENZOËHARZ; ITAL., BENZOINO; SPAN., BENJUI.

A balsamic Resin, obtained from *Styrax Benzoin*, Dry., and probably from other species of *Styrax;* both Siam and Sumatra Benzoin are specifically mentioned in *B.P.*, but the latter very seldom complies with the official characters.

Siam Benzoin consists of about 38·0 p.c. of Benzoic Acid, 56 to 57 p.c. of the Benzoic Ester of Siaresinotannol, and about 5 p.c. of the Benzoic Ester of Benzoresinol, a small amount of Vanillin, and an oily neutral liquid consisting of the Benzoic Ester of Cinnamyl or Benzyl Alcohol. Sumatra Benzoin consists chiefly of the Cinnamic Ester of Benzoresinotannol, some Cinnamic Ester of Benzoresinol, Styracin, Cinnamic Acid Ester of Phenylpropyl Alcohol, a little Vanillin, free Benzoic and Cinnamic Acids, and traces of Benzaldehyde and Benzol.

Solubility.—The tears are as a rule wholly soluble 1 in 5 of Alcohol (90 p.c.); 1 in 1 of Ether; and in Solution of Potassium

Hydroxide. The mass contains impurities, which are left after treating it with Alcohol. The Solution in Alcohol or Ether is acid.

B.P. requires Benzoin to be almost entirely soluble in Alcohol (90 p.c.), but Sumatra Benzoin is rarely so.

Medicinal Properties.—Expectorant, styptic, antiseptic, used in making aromatic fumigating pastilles. The **compound tincture** is given internally for chronic bronchitis; the **vapour** or **spray** is used in chronic laryngeal and bronchial catarrh to check abundant secretion and cough; lint soaked in the compound tincture forms a styptic and antiseptic dressing for wounds.

Prescribing Notes.—*If given in the form of* **mixture** *the Tincture should be emulsified with Mucilage of Gum Acacia, or yolk of Egg. A nice lotion to protect the face from the heat of the sun is made with Tincture of Benzoin* 1, *Rose Water* 40.

Official Preparation.—Tinctura Benzoini Composita. Used in the preparation of Acidum Benzoicum, Adeps Benzoatus, and Unguentum Cetacei.

Not Official.—Tinctura Benzoini, Insufflatio Benzoini, Lait Virginal, Lotio Benzoini, Sevum Benzoatum, Sebum Benzoinatum, Unguentum Benzoini, Vapor Benzoini.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger. (Benzoë), Hung., Ital., Jap., Norw., Port., Russ., Mex., and Span., Swed., Swiss and U.S.

Descriptive Notes.—Several varieties of Benzoin are met with in commerce known respectively as Siam, Saigon, Sumatra, Penang and Palembang. The last three kinds are produced in different districts of Sumatra, probably by different trees. Of each kind several grades occur, varying in freedom from foreign matter and in their appearance. Siam Benzoin almost always occurs in more or less distinct tears, or when agglomerated into masses they leave interstices and the masses have a translucent or varnished surface. The odour of Siam Benzoin recalls that of Vanilla. The tears may vary in size from that of small shot to an inch or two (25 to 50 mm.) in length and breadth and ½ inch (12·5 mm.) in thickness, the tears being usually flattened and of a pale brown externally but milky-white internally. It is remarkably free from impurity and rich in Benzoic Acid, and contains Vanillin. Sumatra Benzoin occurs in solid masses, presenting irregular white tears immersed in a dull greyish-brown resin, and does not exhibit the translucent varnished appearance of the Siam lump Benzoin. It has a characteristic odour resembling Storax rather than Vanilla. It contains Cinnamic as well as Benzoic Acid. It is chiefly produced in Sumatra. Penang Benzoin resembles that of Sumatra, but has a much more pronounced Storax or Hyacinth odour. It is probably produced in W. Sumatra from *Styrax subdenticulatum*, Miq., and comes *viâ* Penang. It is rarely met with in the form of tears. Saigon Benzoin, imported from Cochin China, resembles that of Sumatra in appearance and odour. Palembang Benzoin is distinguished by almost entire absence of white tears and a varnished, not dull, appearance as in Sumatra Benzoin; it has but little odour. It is produced in the East of Sumatra.

Unfortunately the commercial Benzoin which has a Storax odour is sometimes sold under the name of Penang, and sometimes sold under that of Sumatra Benzoin, so that one is often mistaken for the other. Cinnamic Acid is present in Sumatra Benzoin and the Storax smelling Benzoin, but absent in Siam, Saigon, and Palembang Benzoins, according to E. Wightman Bell, who states that Siam is the richest in Benzoic Acid, yielding 30 to 37 p.c.

Tests.—The distinguishing tests for Benzoin are its physical appearance and agreeable aromatic odour; that it readily softens when warmed, and on being subjected to a still higher degree of heat yields vapours of Benzoic Acid; it should be almost entirely soluble in Alcohol (90 p.c.) and in Potassium Hydroxide Solution. The Acid and Saponification values afford useful data for judging the quality of the Gum, but no mention of these values is made in either the *B.P.*, *U.S.P.*, or *P.G.* The Acid value of a good specimen of Siam Benzoin should be between 140–170, and the Saponification value 220–240. Three good commercial samples of Siam Benzoin examined in the author's laboratory, leaving only about 1 p.c. insoluble in Alcohol (90 p.c.), gave Acid values ranging from 154·6 to 184·8, and Saponification values ranging from 197 to 218. A sample of Siam Benzoin which left 14·7 p.c. insoluble in Alcohol (90 p.c.) yielded an Acid value of 123·2, and a Saponification value of 184·8. A fine commercial sample of Sumatra Benzoin, leaving 1·4 p.c. insoluble in Alcohol (90 p.c.), had an Acid value of 132·2, and a Saponification value of 181·5. The five samples of Siam Benzoin left ashes ranging from 0·01 p.c. to 0·88 p.c.; the Sumatra Benzoin left 0·68 p.c. of ash. The solubility in Alcohol (90 p.c.) varies with the origin of the Gum. The best Siam Benzoin is as a rule wholly soluble 1 in 5. Sumatra Benzoin, although distinctly specified, would appear from the description not to be intended for use, since it is almost impossible to obtain it in commerce with less than 7 to 10 p.c. of residue, which is not presumably covered by the words 'almost entirely soluble in Alcohol (90 p.c.).' In view of the use of Benzoin in the preparation of the Compound Tincture, the question of the solubility of the sample assumes some importance.

Attfield has pointed out in his *Digest of Researches and Criticisms* (Report for 1898) that Benzoin containing the usual varying proportions of bark (1 to 30 p.c.) may be employed in preparing the Compound Tincture, due allowance being made for the insoluble matter, until it can be shown that the attached bark has parted with harmful soluble matter to the Alcohol (90 p.c.). The *U.S.P.* requires Benzoin to be almost wholly soluble 1 in 5 parts of warm Alcohol (94·9 p.c.); the *P.G.*, which only recognises the Siam variety, requires that it shall leave not more than 5 p.c. by weight of insoluble residue when exhausted with boiling Alcohol (90 p.c.).

The more generally occurring adulterants are inferior varieties of Gum, Colophony, Storax, Turpentine, and mineral matter. The *B.P.* does not include tests for any of these substances. The *U.S.P.* and *P.G.* require that it should not, on incineration, leave more than 2 p.c. by weight of Ash. The *P.G.* also requires that crystals of Benzoic

Acid shall separate from the colourless fluid obtained on warming 1 part of the Gum with 10 parts of Carbon Bisulphide. Styrax lowers the Acid value, and Turpentine the Ester and Saponification value.

Preparation.

TINCTURA BENZOINI COMPOSITA. COMPOUND TINCTURE OF BENZOIN.

B.P.Syn.—FRIAR'S BALSAM. *N.O.Syn.*—TRAUMATIC BALSAM.

Benzoin, 8; prepared Storax, 6; Balsam of Tolu, 2; Socotrine Aloes, $1\frac{1}{2}$ (less $\frac{1}{40}$)*; macerated with Alcohol (90 p.c.) to yield 80. (1 in 10)

Although Sumatra Benzoin is permitted by the Pharmacopœia only Siam should be used, on account of its superior solubility.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Mex. (Tinctura de benjui compuesta), Port., Swed., and U.S.; Fr. (Teinture Balsamique); the tinctures vary considerably in composition and strength. Not in the others.

Benzoin, in No. 40 powder, 10; Purified Aloes, in No. 40 powder, **2**; Storax, 8; Balsam of Tolu, 4; Alcohol (95 p.c.), *q.s.* to make 100.—*U.S.P.*

Tests.—It possesses a specific gravity of about 0·900, and contains from 17 to 18 p.c. of total solids and about 75 p.c. w/v of Absolute Alcohol. It has been suggested (*C.D.* '02, i. 432) that independently of the percentage of extractive matter, a determination of free and combined Benzoic and Cinnamic Acids should be made, and that a good Tincture should yield not less than about 5 p.c. of balsamic acids calculated as Benzoic Acid, of which neither more nor less than two-fifths should be present in an uncombined condition.

Not Official.

LOTIO BENZOINI.—A nice lotion to protect the face from the sun is made with Tincture of Benzoin, 1; Rose Water, 40.—*Squire.*

This has been incorporated in the *B.P.C.*

LAIT VIRGINAL.—Tincture of Benzoin, 2 fl. drm.; Rose Water, to 8 fl. oz.

A proof-spirit tincture gives the best result, but the Milk is greatly improved by the addition of 3 fl. drm. of Glycerin to the Water. Orange-flower Water or other aromatic Water may also be used.—*Pharm. Form.*

TINCTURA BENZOINI.—1 of Benzoin in powder, macerated with Alcohol (90 p.c.) *q.s.* to yield 10.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S., 1 in 5; all by weight, except U.S. Swiss includes also Tinct. Benzoës Ætherea 1 in 5. The Austr. and Belg. Ph. require the tincture to yield at least 18 p.c. of dry residue; the Dutch not less than 15 p.c.

INSUFFLATIO BENZOINI (*Vigier*).—Tincture of Benzoin, 1; Boric Acid, 1; Starch Powder, 1. Mix, and let the Alcohol evaporate. Used as a snuff in coryza.—*T.G.* '88, 141.

SEVUM BENZOATUM.—Benzoated Suet is prepared in the same manner as Benzoated Lard, Prepared Suet being used in place of Lard.—*Ind.* and *Col. Add.*

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* To be exact, 16 grains are to be taken from every 1½ oz. of Aloes.

Sebum Benzoinatum. Suet, 100; Benzoin, 4; Dried Sulphate of Soda, 6. *Swiss.*

UNGUENTUM BENZOINI.—Benzoin, in fine powder, 1; Adeps, 4.

VAPOR BENZOINI.—Compound Tincture of Benzoin, 60 minims in a pint of Water at 140° for each inhalation.

For bronchitis and laryngitis.

This has been incorporated in the *B.P.C.* as follows:—

Compound Tincture of Benzoin, 0·50; Water at 60° C., 100.

BENZOL.

A colourless, inflammable, volatile liquid, containing about 70 p.c. of Benzene and 20 to 30 p.c. of Toluene. It is obtained from Coal-tar Naphtha and must not be confused with Benzin from Petroleum. *See* p. 237.

Introduced into *B.P.* as a solvent for india-rubber.

Solubility.—Insoluble in Water. Soluble in all proportions of Absolute Alcohol, Chloroform, and Ether.

Medicinal Properties.—Stated to be useful in influenza.

Only the purest crystallisable Benzol should be used for internal administration.

Dose.—For children 3 minims, adults 5 minims; prescribed in capsules every two or three hours, or in mixture.

Benzol 80 minims, Alcohol (90 p.c.) ½ oz., Sp. Chloroformi 3 fl. drm., Mucilag. Trag. to 8 oz.; dose, ½ oz. every three hours, in lemonade.—*B.M.J.* '92, i. 171; '93, ii. 1425; *L.* '92, i. 234.

Foreign Pharmacopœias.—Official in Dutch, Fr. (Benzine), Mex. (Bencina), Port. (Benzina), and Swed.

Tests.—The distinguishing tests for Benzol are its peculiar somewhat aromatic odour, its specific gravity, about 0·885. It should commence to boil at 80° C. (176° F.), nine-tenths should distil below 100° C. (212° F.), and the remainder below 120° C. (248° F.).

The *U.S.P.* gives the specific gravity as 0·871 at 25° C. (77° F.), and the boiling point as 80·4° C. (176·7° F.).

The more generally occurring impurities are readily oxidisable organic compounds or Thiophene. The *B.P.* does not include tests for these compounds. The *U.S.P.* requires that Sulphuric Acid mixed with an equal volume of Benzol shall not become coloured, indicating the absence of readily charred organic impurities; and that no green or blue tint shall be developed on shaking it with quarter its volume of Sulphuric Acid and one drop of Fuming Nitric Acid, indicating the absence of Thiophene.

Not Official.

BERBERIS.

The Bark of the root of *Berberis vulgaris*, L.

It contains the alkaloids, **Berberine** $C_{20}H_{17}NO_4$, and **Oxyacanthine** $C_{19}H_1NO_3$.

The dried stem of *Berberis Aristata* is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies, also **Tinctura Berberidis,** 1 in 10 of Alcohol (60 p.c.), dose, 30 to 60 minims = 1·8 to 3·6 c.c.

Medicinal Properties.—A bitter tonic. Has been used with success in intermittent fevers.

It has also been used in India as a local application in affections of the eye.

EXTRACTUM BERBERIDIS FLUIDUM.—Made with Alcohol (60 p.c.). One fl. oz. of Extract is equal to 1 oz. of Bark.

Dose.—20 to 60 minims = 1·2 to 3·6 c.c.

Liquor Berberidis Concentratus (1 in 2), dose 30 to 60 minims, is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

BERBERINÆ PHOSPHAS.—This is the most soluble salt of Berberine. Soluble 1 in 15 of Water; 1 in 9 of hot Water, but part separates out on standing; it is also thrown down as a yellow precipitate by excess of Alcohol.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

Not Official.

BETEL.

The Leaves of *Piper Betle*, L., are official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies. It is largely employed in India as a masticatory in conjunction with Lime and the nut of *Areca Catechu*, L.

Not Official.

BETULÆ ALBÆ OLEUM.

BIRCH TAR OIL.

Syn.—OLEUM RUSCI.

A bituminous liquid obtained by destructive distillation of the Wood of *Betula alba*, L., produced in Russia.

Principally employed as an application in skin diseases, also in rheumatism and gout. Was at one time given also internally, in doses of 3 to 8 grains = 0·2 to 0·52 gramme, in pill.

Official in Austr., Jap. and Swiss.

Oleum Betulinum Rectificatum.—A light-brown Oil, obtained by the steam distillation of Birch Tar Oil.

The active constituents of the Rectified Oil are probably Guaiacol and Cresol.—*P.J.* (3) xxi. 661.

Solubility.—Almost insoluble in Water, soluble in all proportions of Alcohol, Chloroform or Ether.

Official in Dutch.

Tests.—The specific gravity should be from 0·900 to 0·920. A saturated aqueous solution of the Oil gives a green coloration on the addition of a few drops of a 1 in 1000 aqueous Ferric Chloride Solution.

Not Official.

TINCTURA RUSCI (*Hebra*).—Birch Tar Oil, 25; Oils of Lavender, Rue and Rosemary, of each 1; Ether, 36; Alcohol (90 p.c.), 36.

Official in Austr., Lavender Oil, 1; Rosemary Oil, 1; Birch Tar Oil, 26; Ether, 36; Alcohol, 36.

UNGUENTUM OLEI BETULÆ.—Birch Tar Oil, 5 fl. drm.; Yellow Beeswax, 120 grains; melt the Beeswax, add the Oil, and stir till cold.

Used in psoriasis and dry eczema.

Caution.—The use of this Ointment in eczema demands care.

UNGUENTUM BETULÆ COMPOSITUM. Oil of Cade, 10; Resorcin, 1; Ichthyol, 1; Birch Tar Oil, 1; Lard, 30.—*St. George's.*

Not Official.

BISMUTHUM.

Bi, eq. 207·30.

FR., BISMUTH PURIFIÉ; GER., WISMUT; ITAL., BISMUTO; SPAN., BISMUTO.

Bismuth in its crude state is generally impure; the official salts, however, are required to give no reaction with a special test for Selenium and Tellurium.

Official in Mex. (Bismuto), Port., Span. and Swiss.

Official Bismuth Salts.—Bismuthi Carbonas, Bismuthi Oxidum, Bismuthi Salicylas, and Bismuthi Subnitras.

Not Official.—Bismone (Colloidal Bismuth Oxide), Bismuthum Purificatum, Bismuthi Benzoas, Bismuthi Betanaphtholas (Orphol), Bismuthi et Cerii Salicylas, Bismuthi Citras, Bismuthi et Ammonii Citras, Bismuthi et Cinchonidinæ Iodidum (Erythrol), Bismuthi Di-thio-Salicylas (Thioform), Bismuthi Iodoresorcin Sulphonas (Anusol), Bismuthi Methylenedigallas (Bismal), Bismuthi Nitras, Bismuthi Oleas, Bismuthi Oxychloridum (Pearl white), Bismuthi Oxyiodogallas (Airol), Bismuthi Phenolas, Bismuthi Phosphas, Bismuthi Quinolini Sulphocyanidum (Crurin), Bismuthi Sulphis, Bismuthi Subgallas (Dermatol), Bismuthi Subiodidum, and Bismuthi Tribromophenolas (Xeroform).

BISMUTHI CARBONAS.

BISMUTH OXYCARBONATE.

$(\mathbf{Bi_2O_2CO_3})_2$, $\mathbf{H_2O}$, eq. 1029·70.

FR., SOUSCARBONATE DE BISMUTH; GER., WISMUTSUBCARBONAT; ITAL., BISMUTO CARBONATO; SPAN., CARBONATO DE BISMUTO.

A white or almost white, odourless and tasteless amorphous powder, which varies much in density; the lighter variety is most suited for dispensing, being more easily suspended.

It may be prepared from the Subnitrate by precipitation with Ammonium Carbonate.

Solubility.—Soluble with effervescence in Nitric Acid; insoluble in Water.

Medicinal Properties.—Similar to the Subnitrate, and often preferred to it.

The Carbonate is most generally useful as a gastric sedative; the Subnitrate is the most effective as an intestinal antiseptic, the Salicylate being weaker and the Carbonate inert for this purpose.—*L.* '05, i. 432.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Prescribing Notes.—*Suspended in mixture by Compound Tragacanth Powder.*

Mucilage of Gum Acacia is not a good vehicle for Bismuth salts. On standing, a compact mass forms at the bottom of the bottle, which is difficult to diffuse.

When Sodium Bicarbonate is to be given with a Bismuth salt, the Carbonate should be selected.

The following prescription is a good one for pyrosis: Bismuthi Carbonatis, 2 drm.; Magnes. Carb. Levis, 1 drm.; Pulv. Tragac. Comp., 1 drm.; Aq. Flor. Aurant., Glycerini, of each 2 fl. drm.; Aquæ Chloroformi, 1½ fl. oz.; Aquam ad 6 fl. oz. 3 to 4 teaspoonfuls three times a day after meals.

Official Preparation.—Trochiscus Bismuthi Compositus.

Not Official.—Glycerinum Bismuthi Carbonatis, Mistura Bismuthi, Mistura Bismuthi cum Soda, Pastillus Bismuthi, Pastillus Bismuthi et Morphinæ.

Foreign Pharmacopœias.—Official in Dutch, Jap,, Mex. (Carbonato de Bismuto), Port., Span. and U.S. Not in the others.

Tests.—The distinguishing tests for Bismuth Carbonate are that it dissolves with effervescence in Hydrochloric Acid yielding a solution from which: (1) Hydrogen Sulphide throws down a brownish-black precipitate, insoluble in Ammonium Hydrosulphide Solution, in Potassium or Sodium Hydroxide Solution, but soluble in hot Nitric Acid; (2) except in the presence of Citric Acid or Citrates, Ammonium, Potassium or Sodium Hydroxide Solution throws down a white precipitate insoluble in excess; (3) the copious dilution with Water of a strong solution of the salt in a sufficiency of mineral acid results in the formation of a white precipitate; in the case of the solution in Nitric Acid if no precipitation results on dilution, the addition of Ammonium or Sodium Chloride Solution brings about immediate precipitation, the presence of Tartaric Acid not affecting the precipitation; (4) the addition of Potassium Chromate Solution causes a yellow precipitate insoluble in Potassium or Sodium Hydroxide Solution, soluble in dilute Nitric Acid. When treated with Hydrochloric Acid it effervesces briskly evolving a gas, which, passed through Calcium Hydroxide Solution, affords a white precipitate. The salt is officially required to indicate 99·93 p.c. of Bismuth Carbonate, as ascertained from the weight of Bismuth Sulphide (99·0 p.c.) resulting from precipitation with Hydrogen Sulphide, the *B.P.* employing the latter reagent for the determination of the Bismuth. A weighed quantity of 1 gramme of the Carbonate is dissolved in a little Hydrochloric Acid, the solution diluted with Water acidified with Hydrochloric Acid, and Hydrogen Sulphide is passed through the solution until the Bismuth is completely precipitated. The precipitate is filtered off, rapidly washed with Water and dried at 100° C. (212° F.) till constant in weight, and when cool, weighed. The weight of Bismuth Sulphide should amount to 0·99 gramme. The *U.S.P.* method of determination is to ignite at a red heat and to weigh the residue of Bismuth Oxide which should amount to not less than 90 p.c., equivalent to 100 p.c. of Bismuth Subcarbonate. The results obtained by the Sulphide method of determination are likely to be much higher than those obtained by the *U.S.P.* method owing to the tendency towards co-precipitation of Sulphur which would not be washed out and which would be weighed as Bismuth Sulphide. It is considered (*C.D.* '98, i. 674; '98, ii. 348) that the differences by the ignition method are much smaller than those occurring in the Sulphide method.

The Carbonate is not official in the *P.G.*

The more generally occurring impurities are Arsenic, Calcium, Copper, Iron, Lead, Magnesium, Silver and Zinc, Chlorides, Nitrates and Sulphates, Selenium and Tellurium. These are characteristically lumped together by the *B.P.* without any regard to their relative importance, and so long as the salts are 'suitably treated,' the usual tests for these substances are employed. A standard of 2 parts per 1,000,000 is suggested (*C.D.* '08, i. 795) for Arsenic. It should yield no reactions for Arsenic when examined by the Bettendorf's test. When 3 grammes of the salt is dissolved in just sufficient warm Nitric Acid to affect solution, and this solution be then poured into 100 c.c. of Water, filtered, the filtrate evaporated on a water-bath to 30 c.c., and again filtered; portions each of 5 c.c. of this filtrate should not yield a blue supernatant fluid on the addition of an excess of Ammonia Solution when the precipitate is allowed to settle, indicating the absence of Copper; should not become cloudy when mixed with an equal volume of Diluted Sulphuric Acid, indicating the absence of Lead; should not yield a precipitate on the addition of Hydrochloric Acid, indicating the absence of Silver, nor yield a turbidity on the addition of Barium Chloride Solution, indicating the absence of Sulphates. If 1 gramme of the salt be dissolved in equal parts of Acetic Acid and Water, and the Bismuth be completely removed by Hydrogen Sulphide, the filtrate from the Sulphide precipitate should yield no residue on evaporation, indicating the absence of metals of the alkalis and alkali earths. The *U.S.P.* disregards the presence of Iron and Zinc, Selenium and Tellurium, except in so far as the two latter are covered by Bettendorf's Arsenic test. A special test for Ammonium salts with Potassium Hydroxide Solution is given, a limit for Chlorides is adopted and in contradistinction to the *B.P.* the presence of Nitrates is prohibited; the *B.P.* allows not more than the slightest reactions. The commercial Carbonate invariably contains more than a trace of Nitrate (*P.J.* (3) xiii. 936; (3) xviii. 721, 780), but it can be obtained in commerce free from Nitrate (*C.D.* '98, i. 837). Nitrates may be detected, if present, by the Ferrous Sulphate and Sulphuric Acid test given under that heading in the small type below; Chlorides by the test given under the heading of Silver Nitrate. When testing for Selenium and Tellurium the *B.P.* removes the major portion of the Bismuth as an oxy-salt by the addition of Sodium or Ammonium Chloride to the Nitric Acid solution, and adds an excess of Sodium Sulphite to the filtrate; no precipitate or coloration should be given after 12 hours, indicating the absence of Selenium and Tellurium. A delicate test for Tellurium given (*C.D.* '97, i. 631) is to dissolve without heat 10 grains of Bismuth salt in 60 minims of strong Hydrochloric Acid mixed with 60 minims of Water; add 10 grains of Sodium Hypophosphite; an evolution of Nitrous fumes will take place in the case of Subnitrate and of Carbonic Anhydride only if it be Carbonate, but no development of colour or precipitation if the Bismuth salt be pure. If Tellurium be present in very small proportion a black precipitate will form, and if Arsenic be the impurity the precipitate will be brown.

Ferrous Sulphate and Sulphuric Acid.—If a mixture of 0·05 gramme of Bismuth Subcarbonate and 5 c.c. of equal parts of Water and Ferrous Sulphate T.S. be agitated and poured as a layer over 5 c.c. of Sulphuric Acid (free from

Nitrous compounds) no brownish-red zone should form at the junction of the liquids, indicating a limit of Subnitrate, *U.S.P.*

Silver Nitrate.—If the precipitate (if any) formed by the addition of 0·1 c.c. Tenth-normal Volumetric Silver Nitrate Solution to a solution of 0·3 gramme of Bismuth Subcarbonate in 10 c.c. of Nitric Acid be filtered off the clear filtrate should be unaffected by the further addition of the reagent, indicating a limit of Chlorides, *U.S.P.*

Gravimetric Determination. 1 gramme of Bismuth Subcarbonate ignited in a porcelain crucible should yield a residue of not less than 0·9 gramme of Bismuth Oxide, *U.S.P.*

Preparations.

TROCHISCUS BISMUTHI COMPOSITUS. COMPOUND BISMUTH LOZENGE.

2 grains of Bismuth Oxycarbonate, 2 grains Heavy Magnesium Carbonate, and 4 grains Precipitated Calcium Carbonate in each, with Rose basis.

Dose.—1 to 6 lozenges.

A modification, known as the **Gastric Antacid Lozenge**, has been recommended by Sir W. Roberts; the Bismuth is omitted and Sodium Chloride added. —*B.M.J.* '89, ii. 374.

Foreign Pharmacopœias.—Official in Port., 1½ grain of subnitrate in each. Not in the others.

Not Official.

GLYCERINUM BISMUTHI CARBONATIS. — Bismuth Oxynitrate, 2820 grains; Water, 3 fl. oz.; Nitric Acid, 4½ fl. oz. Dissolve the Bismuth Oxynitrate in the mixture of Water and Nitric Acid and pour into a solution of Ammonium Carbonate 5½ oz. in Water 30 fl. oz., wash the precipitate by decantation, drain, and mix the residue with Glycerin, *q.s.* to make 10 fl. oz. This preparation contains 1 grain of Bismuth Oxycarbonate in 2 minims.—*St. Thomas's.*

Bismuth Nitrate, in crystals, 100; Nitric Acid, 15; Ammonium Carbonate, 50; Distilled Water, 360; Glycerin, *q.s.* to produce 100. The product contains about 50 p.c. of Bismuth Carbonate.—*B.P.C.*

The *B.P.C. Supplement* gives the first formula as an alternative method, with the *syn.* Bismuth Cream.

MISTURA BISMUTHI.—Glycerin of Bismuth Carbonate, 30 minims; Water, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

MISTURA BISMUTHI CUM SODA.—Bismuth Oxycarbonate, 15 grains; Sodium Bicarbonate, 10 grains; Tragacanth, in powder, 1 grain; Water, to 1 fl. oz. This mixture may be made without Tragacanth, but the Bismuth Oxycarbonate subsides more quickly.—*St. Thomas's.*

Sodium Bicarbonate, 10 grains; Bismuth Mixture, *q.s.* to produce 1 fl. oz.—*B.P.C.*

PASTILLUS BISMUTHI.—Carbonate of Bismuth, 3 grains; Glycerin, 3 minims. Rub together and add the mixture to the melted Glycogelatin, 18 grains.—*Throat.*

This has been incorporated in the *B.P.C.*

PASTILLUS BISMUTHI ET MORPHINÆ.—Carbonate of Bismuth, 3 grains; Acetate of Morphine, $\frac{1}{40}$ grain; Glycerin, 3 minims; Glycogelatin, 18 grains.—*Throat.*

This has been incorporated in the *B.P.C.*

BISMUTHI OXIDUM.

BISMUTH OXIDE.

Bi_2O_3, eq. 462·24.

A pale yellowish-white, amorphous powder.

It may be prepared by the interaction of Bismuth Oxynitrate and Sodium Hydroxide Solution at a boiling heat.

Solubility.—Insoluble in Water; soluble in Nitric Acid mixed with half its volume of Water.

Medicinal Properties.—Similar to the subnitrate.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Not Official.—Bismuthi Oxidum Hydratum and Cremor Bismuthi.

Tests.—Bismuth Oxide should answer the tests distinctive of Bismuth given under the Carbonate. It is officially required to contain 99·68 p.c. of Bismuth Oxide, as gravimetrically determined by conversion into Bismuth Sulphide. 1 gramme of the Oxide should yield 1·1 gramme of the Sulphide. The objections to this method of determination are given under Bismuth Carbonate.

The more generally occurring impurities are such as are also found in the Carbonate and are there discussed. In addition it may contain Bismuth Oxycarbonate or the Oxynitrate, or moisture, in which case there will be an appreciable loss of weight when a weighed quantity is heated to incipient redness. Such diminution in weight is officially prohibited.

Not Official.

BISMUTHI OXIDUM HYDRATUM.—A white amorphous powder, soluble in an excess of Hydrochloric Acid and precipitated again on the addition of Water as Oxychloride. It mixes readily with Water to form a cream.

Official in Fr. and Span.

CREMOR BISMUTHI.—Hydrated Bismuth Oxide, 1; Water, 4. Rub together till smooth.

Under the name '**Intestin**' a mixture containing Bismuth Oxide, Benzoic Acid and Naphthalene has been introduced.

BISMUTHI SALICYLAS.

BISMUTH SALICYLATE.

$C_6H_4.OH.COO.BiO$, eq. 359·19.

A white or nearly white, odourless powder, but also supplied in crystals. It should contain 62 to 64 p.c. of Bismuth Oxide.

It may be prepared by precipitating Bismuth Nitrate with a solution of Sodium Salicylate.

Solubility.—Insoluble in Water and Alcohol (90 p.c.).

Medicinal Properties.—An excellent intestinal antiseptic and sedative; has been given with success in gastro-intestinal affections, particularly the summer diarrhœa of children.

Dose. 5 to 20 grains = 0·32 to 1·3 gramme.

Prescribing Notes.—*Given in* **cachets**, *or in a* **mixture** *suspended with Mucilage. The salt is dissociated by contact with Water, and if an alkaline Carbonate be present the mixture effervesces; in such cases it is better to prescribe Bismuth Carbonate and Sodium Salicylate.*

Foreign Pharmacopœias.—Official in Austr., Belg., Ger., Ital., Jap. and Swiss, 63 p.c. of Bismuth Oxide; Dutch, 60 to 65 p.c.; Fr. and Mex., 61 p.c.; Russ., 60 p.c.; Dan. and Swed. 60 p.c.; Norw. and Span., no p.c. given; U.S., 62 to 64 p.c. Not in the others.

Tests.—Bismuth Salicylate, when dissolved in diluted Hydrochloric Acid, and the Salicylic Acid separated, yields the distinctive tests for Bismuth which are mentioned under Bismuth Carbonate. It gives a violet coloration when treated with diluted Ferric Chloride Test-solution. The salt undergoes dissociation rapidly and even Alcohol (90 p.c.) causes the liberation of a certain amount of free Salicylic Acid notwithstanding the official requirement that such alcoholic liquid should not give a violet coloration with Ferric Chloride Test-solution. It is officially required to contain 98·59 p.c. of Bismuth Salicylate as gravimetrically determined by conversion into Bismuth Sulphide; 1 gramme of the Salicylate is required to yield 0·7 gramme of the Sulphide. When gravimetrically determined as Oxide it is officially required to yield 96·35 to 99·46 p.c. of Bismuth Salicylate. It will thus be seen that the amount of Bismuth Salicylate calculated from the Sulphide determination does not agree with that calculated from the Oxide determination. The *U.S.P.* requires it to yield not less than 62 p.c. nor more than 66 p.c. of Bismuth Oxide, when ignited as described in the small type below under the heading of Gravimetric Determination. This amount of Bismuth Oxide calculates out to not less than 96·4 p.c. nor more than 102 p.c. of Bismuth Salicylate. The *P.G.* requires it to leave not less than 63 p.c. of Bismuth Oxide when the salt is calcined as described in the same paragraph; corresponding to a calculated figure of not less than 97·96 p.c. of Bismuth Salicylate.

The more generally occurring impurities are Arsenic, Calcium, Copper, Iron, Lead, Magnesium, Silver and Zinc; Selenium and Tellurium, Chlorides, Nitrates and Sulphates, free Salicylic Acid.

The detection of the majority of these impurities is referred to under Bismuth Carbonate; in carrying out the tests for them the Bismuth Oxide left on the ignition of the Salicylate should be dissolved in Nitric Acid, and the major portion of the Bismuth removed as an oxy-salt. With regard to the detection of free Salicylic Acid the methods adopted vary. The employment of Alcohol (90 p.c.) as recommended in the *B.P.* results in the liberation of a sufficient amount of free Salicylic Acid to give a pronounced coloration with Ferric Chloride Test-solution. Chloroform is a more appropriate solvent and the *U.S.P.* test is carried out with this menstruum; a weighed quantity of 1 gramme of the salt being shaken with 5 c.c. of Chloroform and the chloroformic solution filtered into an equal volume of Water containing 3 drops of the Ferric Chloride Test-solution, when no violet zone should form at the junction of the two liquids within one minute. The *P.G.* requires that a weighed quantity of 0·5 gramme of the salt when shaken with 5 c.c. of water shall yield a filtrate which produces no reddening of blue Litmus paper, but does not also test the solution with Ferric Chloride Test-solution.

The Salicylic Acid liberated when the salt is treated with an acid, when filtered off, washed free from mineral acid and carefully dried, should possess the melting point and answer the tests given under Acidum Salicylicum and should otherwise conform to the tests of purity given for this acid. The *B.P.* and *P.G.* formulate no such requirement; the *U.S.P.* has carefully noted this.

The three Pharmacopœias differ widely in the test adopted for the detection of Nitrates. The *U.S.P.* uses a mixture of Bismuth Salicylate, Sodium Salicylate and Sulphuric Acid; the *P.G.* test depends upon the reduction of the Nitrates to Ammonia by the use of Zinc foil and powdered Iron and its liberation by Sodium Hydroxide Solution (15 p.c.); the *B.P.* depends upon the formation of Nitrous Oxide and liberation of red fumes when the salt is warmed with Sulphuric Acid and Copper; the *U.S.P.* and *P.G.* tests are compared in detail in small type below under the heading of Sodium Salicylate and Sulphuric Acid and Zinc foil, powdered Iron, and Sodium Hydroxide. The most delicate is that of the *U.S.P.* Both the *U.S.P.* and *P.G.* employ Bettendorf's test as a means of detecting Arsenic. The Uranium Nitrate test for distinguishing it from Carbolates and Sulpho-carbolates is peculiar to the *B.P.*, and is commented upon in the large type under Acidum Salicylicum.

Sodium Salicylate and Sulphuric Acid.—0·05 gramme triturated with 0·1 gramme of Sodium Salicylate and 5 c.c. of Water, carefully poured as a layer over 5 c.c. of Sulphuric Acid (free from Nitrous Compounds) should not immediately form a pink to brownish red zone, *U.S.P.*

Zinc Foil, Powdered Iron, and Sodium Hydroxide.—On warming 0 5 gramme Bismuth Subsalicylate with 5 c.c. Sodium Hydroxide Solution and the addition of 0·5 gramme of Zinc foil and reduced Iron, Ammonia gas should not be evolved, *P.G.*

Gravimetric Determination.—If 1 gramme of Bismuth Subsalicylate be calcined and the residue dissolved in Nitric Acid, this solution carefully evaporated, and the residue again calcined, a final residue of at least 0·63 gramme of Bismuth Oxide should be obtained, *P.G.* The *U.S.P.* directs the use of 5 c.c. of Nitric Acid in above test, adding it to the residue drop by drop until solution is complete. The final residue obtained as above should weigh not less than 0·62 gramme and not more than 0·66 gramme.

Stannous Chloride.—The residue of Bismuth Oxide obtained when 2 grammes of Bismuth Subsalicylate is ignited as described above, should not respond to Bettendorf's test for Arsenic, *U.S.P.* A mixture of 1 gramme of Bismuth Subsalicylate and 3 c.c. of Stannous Chloride T.S. should not assume a dark colour in the course of an hour, *P.G.*

Not Official.

BISMUTHI CERII SALICYLAS.—A reddish-white powder, insoluble in Water and Alcohol (90 p.c.). Recommended in diarrhœa and dysentery.

Dose.—5 grains = 0·32 gramme.

The following mixture was proposed by the Royal College of Physicians for use during the prevalence of cholera in 1892.—*L.* '92, ii, 682:—

Cholera Mixture.—Bismuthi et Cerii Salicylas, 5 grains; Mist. Cretæ Aromat., 1 fl. oz.; Tinct. Camph. Co., ½ fl. drm.; Tinct. Chloroformi Co., 20 drops; Spirit Ammon. Aromat., 20 drops; Ess. Menth. Pip., 10 drops.

Should this mixture disagree, or in 24 hours fail to give relief, the following mixture should be substituted and taken in 1 oz. doses every 3 or 4 hours:—

Acid Sulph. Aromat., 15 drops; Tinct. Camph. Co., ½ drm.; Tinct. Chloroformi Co., 20 drops; Tinct. Coto, 20 drops; Syrupi Aurantii Flor., 1 drm.; Aq. Menth. Pip. ad. 1 oz.

BISMUTHI SUBNITRAS.

BISMUTH OXYNITRATE.

$BiONO_3,H_2O$, eq. 302·64.

FR., SOUSNITRATE DE BISMUTH; GER., BASISCHES WISMUTNITRAT; ITAL., SOTTONITRATO DI BISMUTO; SPAN., NITRATO (SUB) BISMUTICO.

A heavy, white, odourless, crystalline powder, which may be prepared from Bismuth Nitrate by the action of Water.

The formula calculates into 77 p.c. of Oxide, but it always contains 79 to 82 p.c. If the compound $BiONO_3$, H_2O exists, it is so unstable that it could certainly not be kept without decomposition.—*C.D.* '85, 561.

Although Mr. David Howard called attention to the inaccuracy of the formula given in *B.P.* '85, the error is repeated in *B.P.* '98. It is also at variance with the official test, which requires that it should yield 84 p.c. of Bismuth Sulphide.

Solubility.—Insoluble in Water. Insoluble in Alcohol (90 p.c.). Soluble in Hydrochloric and in Nitric Acid.

Medicinal Properties.—Sedative and astringent both internally and externally. It is highly useful in pyrosis, all forms of vomiting and irritative dyspepsia; in gastric ulcer, also in diarrhœa from any cause; usually combined with Soda, Magnesia, Opium, etc.; it renders the fæces leaden-grey in colour. It is recommended to be injected in gonorrhœa and leucorrhœa, 60 grains to the oz. of Water; the Bismuth is mixed with an equal quantity of Glycerin or suspended with Compound Tragacanth powder. The addition of Bismuth to mixtures for diarrhœa of phthisis controls it better than other ingredients alone. As an intestinal antiseptic, *see* under Bismuthi Carbonas.

Externally it is sometimes used as a cosmetic, but is more or less blackened by an impure atmosphere; as lotion, powder, or ointment in burns, eczema, and other skin diseases when exudation and itching are present; also as an ingredient of Ferrier's Snuff in acute coryza and chronic rhinitis.

Has been recommended as a dressing for wounds.—*L.* '85, ii. 634; *T.G.* '85, 266; *B.M.J.* '01, ii. 811.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Prescribing Notes.—*When prescribed in a* **mixture,** *it should be suspended with Compound Powder of Tragacanth,* 1 *drm. in a* 6-*oz. mixture.* See *Bismuthi Carbonas.*

As Bismuth Oxynitrate in Water slowly parts with its Nitric Acid, the mixture is always acid, and this somewhat interferes with its suspension, and when prescribed with Sodium Bicarbonate it causes a slight but steady evolution of Carbonic

Acid, which may cause the bottle to burst; these objections do not apply to the Bismuth Carbonate, which is therefore preferable in mixtures.

Incompatibles. Effervescence ensues if prescribed in Water with Alkaline Bicarbonates. With Potassium Iodide double decomposition slowly ensues.

Official Preparations.—Used in the preparation of Liquor Bismuthi et Ammonii Citratis, and Bismuthi Oxidum.

Not Official.—Ferrier's Snuff, Elixir Bismuthi, Glyceritum Bismuthi, Liquor Bismuthi Conc., Lotio Bismuthi, Mistura Bismuthi Comp., Mistura Bismuthi Composita cum Pepsino, Mistura Bismuthi Composita cum Morphina, Unguentum Bismuthi Oleatis, and Unguentum Bismuthi.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—The distinguishing tests for Bismuth are given in large type under Bismuth Carbonate, and the Subnitrate when dissolved in dilute Nitric Acid should conform to these. When heated in a porcelain crucible nitrous vapours are evolved and a white residue of Bismuth Oxide remains; red fumes are evolved when a little of the salt is warmed with Sulphuric Acid and metallic Copper; after separation of the Bismuth the filtrate affords when mixed with an equal volume of Sulphuric Acid, cooled and poured gently on to the surface of Ferrous Sulphate Solution a brown ring at the junction of the two fluids. It is officially required to contain 99·68 p.c. of Bismuth Subnitrate, as gravimetrically determined by conversion into Bismuth Sulphide. 1 gramme of the Subnitrate is required to yield 0·84 gramme, corresponding to 84 p.c. of the Sulphide. The criticism of this method of determination appearing under Bismuth Carbonate applies with still greater force here, as owing to the oxidising influence of Nitric Acid, Sulphur is almost certain to be precipitated along with the Bismuth Sulphide. The *U.S.P.* and *P.G.* employ the Oxide method of determination, the former requiring that the salt shall yield not less than 80 p.c. of pure Bismuth Oxide, the latter that it shall yield from 79 to 82 p.c. of Bismuth Oxide. Bismuth Subnitrate is distinguished from the Carbonate by being soluble without effervescence in diluted Nitric Acid, from the Oxychloride by dissolving in Acetic Acid.

The more generally occurring impurities are Arsenic, Calcium, Copper, Iron, Lead, Magnesium, Silver, and Zinc; Chlorides and Sulphates; Carbonates; Selenium or Tellurium; Calcium Phosphate. A standard of 2 parts per 1,000,000 is suggested (*C.D.* '08, i. 795) for Arsenic. With the exception of Carbonates and Calcium Phosphate the remarks upon the detection of these impurities appearing under Bismuth Carbonate are also applicable here. The presence of Carbonates is shown by effervescence produced when the salt is dissolved in Nitric Acid; Calcium Phosphate by a precipitate or opalescence produced when a solution of 1 gramme of the salt in Nitric Acid is mixed with a solution containing twice this weight of Citric Acid and sufficient Ammonia Solution to produce a decided alkalinity. Neither the *U.S.P.* nor the *P.G.* include a similar test. The *U.S.P.* requires that no residue should be left when the salt is dissolved in warm Nitric Acid, indicating the absence of foreign salts.

Diluted Sulphuric Acid.—The *P.G.* directs that 0·5 gramme should form a clear solution at ordinary temperature with 25 c.c. of Diluted Sulphuric Acid without evolution of Carbon Dioxide, indicating the absence of Lead and Carbonates.

Stannous Chloride Solution.—If 1 gramme of Bismuth Subnitrate be heated until vapours cease to be given off, the residue cooled and dissolved in a little Hydrochloric Acid, this solution, with double its volume of Stannous Chloride Solution, should not assume a dark colour in the course of an hour, *P.G.* The *U.S.P.* requires that the residue, obtained by heating 2 grammes of Bismuth Subnitrate in a porcelain crucible until nitrous vapours cease to be given off, should weigh not less than 1·6 grammes and should not respond to Bettendorf's test for Arsenic.

Silver Nitrate Solution.—0·5 gramme of Bismuth Subnitrate dissolved in 5 c.c. of Nitric Acid should give a clear solution which is not rendered more than opalescent by 5 c.c. of Silver Nitrate Solution, *P.G.*

Barium Nitrate Solution.—0·5 gramme should dissolve to a clear solution in 5 c.c. of Nitric Acid, and be unaffected by 0·5 c.c. of Barium Nitrate Solution diluted with an equal quantity of Water, *P.G.*

Potassium or Sodium Hydroxide Solution.—Warmed with Sodium Hydroxide Solution in excess, Bismuth Subnitrate should not evolve Ammonia, *P.G.*; the *U.S.P.* directs that 1 gramme of the salt be boiled with 5 c.c. Potassium Hydroxide T.S.

Gravimetric Determination.—The *P.G.* requires that 100 parts of Bismuth Subnitrate heated until the evolution of yellowish red fumes ceases should yield from 79 to 82 parts of residue; and the *U.S.P.* that 2 grammes, heated in a porcelain crucible until nitrous vapours cease to be evolved, should yield a residue weighing when cold not less than 1·6 grammes.

Preparation.

LIQUOR BISMUTHI ET AMMONII CITRATIS. SOLUTION OF BISMUTH AND AMMONIUM CITRATE. *B.P.Syn.*—LIQUOR BISMUTHI.

A clear, colourless liquid possessing generally a faint odour of Ammonia and a slight metallic taste; 1 fl. drm. is equal to rather less than 3 grains of Bismuth Oxide.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

A formula is given in *U.S.N.F.*, using Glycerite of Bismuth (*see* below), Alcohol and Distilled Water. 1 fl. drm. equals 1 grain Bismuth and Ammonium Citrate.

Tests.—Bismuth and Ammonium Citrate Solution should possess a specific gravity of 1·070. It should be faintly alkaline in reaction towards red Litmus paper, and when warmed with an excess of Potassium or Sodium Hydroxide Solution should yield a strong ammoniacal odour and a white precipitate. It is officially required to contain 9 p.c. by weight equivalent to 9·61 p.c. w/v of Bismuth Ammonium Citrate $BiC_6H_5O_7(NH_3)_3$, eq. 445·64, as gravimetrically determined by precipitation of the Bismuth as Sulphide. The amount of Bismuth Sulphide yielded by the *B.P.* test is 5·14 p.c. by weight equivalent to 5·5 p.c. w/v; the corresponding amount of Bismuth Oxide being 4·65 p.c. by weight equivalent to 5 p.c. w/v.

The more generally occurring impurities are Arsenic, Copper, Iron, Lead, Silver, Selenium or Tellurium. Of these the more important are Arsenic and Lead, Selenium and Tellurium. To detect these impurities the liquor is evaporated to dryness, ignited and the residue redissolved in diluted Nitric Acid. The presence of Arsenic may be detected by Bettendorf's test, Lead by diluted Sulphuric Acid after separation of the Bismuth as an oxy-salt, and Selenium or Tellurium by the Sodium Hypophosphite or Sodium Sulphite tests.

A good deal of controversy has ranged round the official method of preparation. The earlier criticisms (*C.D.* '98, i. 620) were apparently favourable to the new formula. Later (*C.D.* '98, i. 955) it has been pointed out that when the process is carried out strictly according to the *B.P.* directions that considerable difficulty arises in taking into solution the whole of the Bismuth Citrate precipitate, it being shown that the quantity of Ammonium Citrate ordered is the main factor in determining this insolubility. An increase in the amount of Ammonium Citrate is also suggested (*C.D.* '99, ii. 211, 233; *P.J.* '99, ii. 101, 116), the addition of Liquor Ammonii Citratis (after the solution of the precipitate), in the proportion of 8 fl. oz. (or 400 c.c.) and then dilution to 20 fl. oz. (or 1000 c.c.) is recommended. Amongst other modifications suggested in the same reference are the omission of the addition of Distilled Water until the liquid is very faintly opalescent; the use of 236 grains instead of 175 grains of Potassium Carbonate per pint of liquor, the latter quantity being inadequate to neutralise the free Nitric Acid and a corresponding amount of Bismuth being lost in the acid liquid; the non-dilution of the Bismuth Oxynitrate and Nitric Acid mixture; the reversion of the order of mixing, the Bismuth mixture being added to the Potassium Citrate and Carbonate instead of *vice versa*; and the use of a definite quantity of Water for dissolving the Potassium salts. The precipitate thus produced is easily washed, and is perfectly soluble. Samples containing the exact amount of Ammonium Citrate recommended by the *B.P.* formula deposit when dispensed with alkali Bicarbonates, solutions containing an additional quantity remain clear.

The conclusion drawn (*C.D.* '02, i. 852; '02, ii. 312; *P.J.* '02, ii. 135) is that Bismuth Citrate is an acid and not a salt, being Citric Acid with one of the Hydrogen atoms replaced by Bismuthyl. Its acid properties are shown by it forming salts with Ammonia and yielding an effervescence with alkali Carbonates and Bicarbonates. Determinations of the combining weight of the acid are also recorded in support of this theory. The following process is suggested:—629 grains of Bismuth Subnitrate mixed in a mortar with $1\frac{1}{2}$ fl. oz. of Water, is set aside for 2 hours, occasionally stirring, or until the mixture yields a clear solution with Ammonia Solution; sufficient of the latter is then added to form a clear solution and the mixture diluted to 20 fl. oz. with water and filtered. An alteration in the official title to Liquor Ammonii Bismuthyl-Citratis is recommended. The chief drawback to the official method of preparation appears (*P.J.* '99, ii. 604) to be the use of a smaller quantity of Potassium Citrate than is necessary for converting the whole of the Bismuth into Citrate. The method recommended in this reference is to dissolve 70 grammes Bismuth Oxynitrate in diluted Nitric Acid by gently warming, to add 50 grammes of Citric Acid dissolved in a little water (and if a

Carbonate is used two-thirds of it may be mixed with the Citric Acid), and a solution of 103 grammes of Potassium Bicarbonate or 86 grammes of Sodium Bicarbonate and dilute with hot Water to 1000 c.c., cool, filter and wash free from Nitrate. The precipitate is dissolved in 60 c.c. of Liquor Ammoniæ *B.P.* diluted to 200 c.c. with Water and made up to 1000 c.c. or to a specific gravity of 1·070.

Not Official.

ELIXIR BISMUTHI.—Bismuth and Ammonium Citrate, 3·50; Distilled Water, hot, 6; Water of Ammonia (*U.S.P.*), *q.s.*; Aromatic Elixir, *q.s.* to produce 100.—*U.S.N.F.* 1896.

This has been incorporated in the *B.P.C.*

Glycerite of Bismuth (*N.F.*), 12·5; Glycerin, 12·5; Water, 25; Aromatic Elixir (*U.S.P.*), 50.—*U.S.N.F.* 1906.

BISMUTH ET AMMONII CITRAS EFFERVESCENS.—2 grains are contained in 1 drm.

FERRIER'S SNUFF.—Bismuth Subnitrate, 6 drm.; Morphine Hydrochloride, 2 grains; Gum Acacia, in powder, 2 drm.—*L.* '76, i. 525.

It is described as a speedy and efficacious remedy for a recent cold in the head; each time the nostrils are cleared another pinch should be taken, using it frequently at first. One quarter to one half of this formula may be used in the twenty-four hours.

Glass insufflators are made to blow it up the nostrils.

This has been incorporated in the *B.P.C.* as follows:—

Insufflatio Bismuthi et Morphinæ.—Bismuth Subnitrate, 75; Morphine Hydrochloride, 0·40; Gum Acacia, in powder, to make 100.

GLYCERITUM BISMUTHI.—A solution of Bismuth and Ammonium Citrate in Ammonia and Water containing Glycerin. 1 fl. drm. contains 16 grains of the salt.—*U.S.N.F.* 1896.

4 c.c. (1 fl. drm.) contains about 1 gm. (16 grains) of Bismuth and Sodium Tartrate.—*U.S.N.F.* 1906.

LIQUOR BISMUTHI CONC.—Dissolve 7 of Bismuth Subnitrate in 10 of equal volumes of Nitric Acid and Distilled Water with a gentle heat; when cold add first a solution of Citric Acid 5 in Distilled Water 7, and subsequently stirring in a solution of Sodium Bicarbonate $8\frac{3}{4}$ in Distilled Water 7. Wash the precipitate free from Nitrates, and after draining dissolve it in solution of Ammonia 6, or a sufficiency, and add solution of Ammonium Citrate 12, and Distilled Water, *q.s.* to yield 50.—*B.P.C. Formulary* 1901.

Incorporated in the *B.P.C.*

LOTIO BISMUTHI.—Bismuth Subnitrate, 10 grains; Water, 1 fl. oz. A sedative lotion in cases of eczema.

MISTURA BISMUTHI COMPOSITA.—Compound Tincture of Cardamoms, 3 fl. oz.; Chloroform, 70 minims; Liquid Extract of Nux Vomica, 135 minims; Diluted Hydrocyanic Acid, 320 minims. Mix and add Concentrated Solution of Bismuth, 15 fl. oz.; Morphine Hydrochloride, 8 grains, dissolved in 4 fl. drm. of Distilled Water; add finally Distilled Water, *q.s.* to yield 20 fl. oz.

Each fl. drm. contains 2 minims of Diluted Hydrocyanic Acid, $\frac{1}{20}$ grain of Morphine Hydrochloride, and the equivalent of 5 minims of Tincture of Nux Vomica.—*B.P.C. Formulary* 1901.

Dose.—20 to 30 minims = 1·2 to 1·8 c.c.

Mistura Bismuthi Composita.—Bismuth Citrate, 320 grains; Solution of Ammonia, *q.s.*; Chloroform, 32 minims; Tincture of Nux Vomica, 1 fl. oz.; Diluted Hydrocyanic Acid, 128 minims; Solution of Carmine (Martindale), 32 minims; Distilled Water, *q.s.* to produce 8 fl. oz. Rub the Bismuth Citrate with a little Water, add Solution of Ammonia until salt is just dissolved and make up to 6 oz. with Distilled Water. Dissolve the Chloroform in the Tincture of Nux Vomica and add to the Bismuth Solution, then add the Solution of Carmine and filter, wash the filter paper with sufficient Distilled Water to produce with the Hydrocyanic Acid 8 fl. oz. of finished product. Each fl. drm. is equivalent to 1 drm. of the *B.P.* Bismuth Solution, 10 minims of Spirit of Chloroform, 7½ minims of Tincture of Nux Vomica, and 2 minims of Diluted Hydrocyanic Acid. **Dose.**—½ to 1 drm.—*Bournemouth Formulary.*

This has been incorporated in the *B.P.C.*

MISTURA BISMUTHI COMPOSITA CUM PEPSINO.—Bismuth Citrate, 320 grains; Solution of Ammonia, *q.s.*; Soluble Scale Pepsin, 64 grains; Chloroform, 32 minims; Tincture of Nux Vomica, 1 fl. oz.; Diluted Hydrocyanic Acid, 128 minims; Solution of Carmine (Martindale), 32 minims; Distilled Water, *q.s.* to produce 8 fl. oz. Rub the Bismuth Citrate with a little Water, add Solution of Ammonia until salt is just dissolved, and make up to 4 oz. with Distilled Water. Dissolve the Pepsin in 2 oz. of Water and add to the Bismuth Solution, then add the Chloroform dissolved in the Tincture of Nux Vomica, and the Carmine Solution, filter, and wash the filter paper with sufficient Water to produce with the Hydrocyanic Acid 8 fl. oz. of finished product. Each fl. drm. is equivalent to Solution of Bismuth, 1 drm.; Spirit of Chloroform, 16 minims; Tincture of Nux Vomica, 7½ minims; Pepsin, 1 grain; Hydrocyanic Acid, 2 minims.—*Bournemouth Formulary.*

This has been incorporated in the *B.P.C.*

MISTURA BISMUTHI COMPOSITA CUM MORPHINA.—Morphine Hydrochloride, 1 grain; Compound Bismuth Mixture, 3 fl. oz. Each fl. drm. contains $\frac{1}{24}$ grain of Morphine Hydrochloride. **Dose.**—½ to 1 drm.—*Bournemouth Formulary.*

This has been incorporated in the *B.P.C.*

UNGUENTUM BISMUTHI.—Bismuth Subnitrate, 60 grains; Lard, 1 oz. Bismuth Subnitrate, 12·5; Lard, 87·5.—*B.P.C.*

BISMUTHI BENZOAS.—A white powder, without taste, almost insoluble in Water. Given internally as an antiseptic and sedative. Used externally as an antiseptic dusting powder.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Foreign Pharmacopœias.—Official in Mex.; not in the others.

Tests.—When dissolved in diluted Hydrochloric Acid and separated from the precipitated Benzoic Acid, the filtrate should answer the tests distinctive of Bismuth given under Bismuth Carbonate. When shaken with a few drops of Ferric Chloride Test-solution a buff coloration is produced. The Benzoic Acid separated from the salt should possess the melting point and conform to the tests for identity and purity given under Benzoic Acid. The salt should leave from 60 to 70 p.c. of Bismuth Oxide after ignition at a low red heat.

It should be free from the impurities mentioned under Bismuth Carbonate.

BISMUTH CITRAS.—A white amorphous, odourless and tasteless powder.

Solubility.—Insoluble in Water; readily in Solution of Ammonia, and in solutions of alkali citrates.

Medicinal Properties.—Similar to the Subnitrate.

Dose.—2 to 5 grains = 0·13 to 0·32 gramme.

Foreign Pharmacopœias.—Official in U.S. Not in the others.

Tests.—The residue obtained on ignition, when dissolved in warm Nitric Acid yields the tests distinctive of Bismuth given under Bismuth Carbonate. The salt chars when first heated and the residue left on ignition is more or less black in colour with a yellow surface. If to the solution of Bismuth Citrate in Ammonia Solution sufficient Hydrogen Sulphide be added to precipitate the whole of the Bismuth, the filtrate, when freed from Hydrogen Sulphide and boiled with an excess of Calcium Hydroxide Solution yields a white precipitate. The salt is official in the *U.S.P.* and is required to contain not less than 95·75 p.c.

nor more than 99·17 p.c. of pure Bismuth Citrate, as gravimetrically determined by weighing the Oxide produced on ignition.

As regards impurities the salt should not respond to Bettendorf's test for Arsenic, it should be free from the impurities mentioned under Bismuth Carbonate and when the Bismuth is separated by Hydrogen Sulphide, the latter removed, the filtrate when mixed with an equal volume of concentrated Sulphuric Acid, and cooled should produce no brown or brownish-black colour round a crystal of Ferrous Sulphate.

BISMUTHI ET AMMONII CITRAS.—Small shining translucent scales, which yield Ammonia when warmed with a solution of a fixed alkali, and gradually lose Ammonia on exposure to the air.

Solubility.—1 in 1 of Water; sparingly in Alcohol (90 p.c.).

Dose.—2 to 5 grains = 0·13 to 0·32 gramme.

Foreign Pharmacopœias.—Official in U.S. Not in the others.

Tests.—A blackish residue with a yellow surface remains when the salt is ignited, and a solution of this residue in warm Nitric Acid yields the tests distinctive of Bismuth given under Bismuth Carbonate. When heated with an excess of Potassium or Sodium Hydroxide Solution, the salt evolves a strong odour of Ammonia and yields a white precipitate. When the Bismuth is separated from its solution by means of Hydrogen Sulphide and the excess of the latter is removed by heat, the filtrate when boiled with an excess of Calcium Hydroxide Solution yields a white precipitate. The *U.S.P.* requires the salt to yield not less than 46 p.c. nor more than 50 p.c. of pure Bismuth Oxide as gravimetrically determined by ignition and oxidation with Nitric acid.

It should be free from the more generally occurring impurities mentioned under Bismuth Carbonate, should not respond to Bettendorf's test for Arsenic, and when separated from the Bismuth by Hydrogen Sulphide and from the excess of the latter by boiling should, when mixed with an equal volume of concentrated Sulphuric Acid and cooled, yield no brown or brownish-black coloration to a crystal of Ferrous Sulphate dropped into the mixture.

BISMUTHI NITRAS ($Bi(NO_3)_3$ 5 H_2O, eq. 481·44).—In colourless transparent crystals. Decomposed by Water, giving a white precipitate of Subnitrate. Soluble in Glycerin, but is slowly deposited from the solution when Water is added.

A **glycerole** can be made containing 60 grains to the oz.; but as an application in skin diseases the strength should in most cases not exceed 10 grains to the oz.—*M.T.* '76, ii. 646.

The salt should be dissolved without the application of heat.

Official in Fr. (Azotate Neutre de Bismuth).

BISMUTHI OLEAS.—Crystallised Bismuth Nitrate, 280 grains; dissolve cold in Glycerin 4 oz. by weight; add slowly Solution of Sodium Oleate, 20 fl. oz.; warm gently, wash by decantation, collect and dry. It forms a pearly-grey soft bland substance.

Medicinal Properties.—It is a reliable application in pustular eruptions and hyperæmia of the skin.—*B.M.J.* '84, ii. 751.

Unguentum Bismuthi Oleatis (Sir T. McCall Anderson).—Oxide of Bismuth, 1 drm.; Oleic Acid, 1 drm.; White Wax, 1½ drm.; Vaseline, 9 drm.—*Pharm. Form.*

Bismuth Oleate, 10; Soft Paraffin, 90.—*B.P.C.*

BISMUTH-PHENOL (Bismuth Phenate).—Prepared by adding a solution of Phenol in an alkali, to a solution of Bismuth Oxynitrate. A greyish-brown amorphous powder, insoluble in Water and Alcohol (90 p.c.). Recommended as an intestinal antiseptic.—*P.J.* (3) xxiv. 182; *C.D.* '93, ii. 576.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

BISMUTHI SUBGALLAS (Dermatol).—A light yellow amorphous insoluble powder, introduced as an odourless substitute for Iodoform.

Sometimes causes symptoms of Bismuth poisoning.

Given for gastric ulcer and diarrhœa in doses of 8 to 30 grains twice a day.—*L.* '97, ii. 404.

Solubility.—Insoluble in Water, Alcohol (90 p.c.) and in Ether. Soluble with decomposition in mineral acids, and readily soluble in alkali Hydroxide Solutions.

Foreign Pharmacopœias.—Official in Austr., 53 to 55 p.c. of Bi_2O_3; Belg., 52 p.c.; Dutch, 52 to 56 p.c.; Dan., Ger., Swed. and Swiss, 52 p.c.; Fr., 56·45 p.c.; Ital., not less than 55 p.c.; Jap., 51 p.c.; Mex. and Russ., no p.c. given; Russ. also includes a **Tannate**; Span., 56·66 p.c.; U.S., 52 to 57 p.c. Not in the others.

Tests.—When strongly heated it chars, and on ignition leaves a yellow residue, which dissolves in Hydrochloric and in Nitric Acids, yielding a solution which answers the tests distinctive of Bismuth given under Bismuth Carbonate. After complete separation of the Bismuth by means of Hydrogen Sulphide and the removal of the latter by boiling, the cold filtrate yields with a drop of Ferric Chloride Test-solution a bluish-black coloration. The salt is official in the *U.S.P.* and in the *P.G.*; the former requires it to yield not less than 52 p.c. nor more than 57 p.c. of pure Bismuth Oxide, the latter not less than 52 p.c. of Bismuth Oxide.

The more generally occurring impurities are Arsenic and those usually associated with Bismuth, Ammonium salts, Carbonate and Nitrate; free Gallic Acid. Bettendorf's test is employed in both Pharmacopœias as a test for Arsenic. The methods of detecting the impurities usually associated with Bismuth are given under Bismuth Carbonate. The *U.S.P.* and *P.G.* both use Alcohol as a solvent for free Gallic Acid, the former being content with the neutrality of the alcoholic solution towards blue Litmus paper as ensuring its absence; the latter evaporating the alcoholic solution to dryness, when no weighable residue should remain. The *U.S.P.* employs the Sulphuric Acid and Ferrous Sulphate test for Nitrate; the *P.G.* the reduction with Zinc and powdered Iron, when on boiling with Sodium Hydroxide Solution (15 p.c.), no evolution of Ammonia should take place.

Bismal (Bismuth Methylendigallate).—Introduced as an astringent for internal administration in cases of diarrhœa. Insoluble in Water.

Dose.—1 to 4 grains = 0·06 to 0·26 gramme.

BISMUTHI OXYIODOGALLAS (Airol, Airoform and Airogen.)—A bulky greyish powder, odourless and tasteless, insoluble in Water and Alcohol; soluble in dilute mineral acids and in Sodium or Potassium Hydroxide Solution. It is gradually converted into a more basic salt by the action of light and moist air, and should therefore be kept in well-stoppered dark amber-tinted glass bottles. A combination of Dermatol with Iodine, introduced as a substitute for Iodoform, has attracted a good deal of attention as an antiseptic dressing. Used as a dusting powder for ulcers, also mixed with Vaseline or anhydrous Lanolin.—*B.M.J.* '98, i. 144; *L.* '99, i. 240.

Sometimes badly tolerated.—*B.M.J.E.* '97, ii. 43.

Comparative experiments with Airol, Dermatol and Iodoform.—*B.M.J.E.* '97, i. 67.

Foreign Pharmacopœias.—Official in Belg. and Swiss. Not in the others.

Tests.—A solution in dilute Hydrochloric Acid gives with Hydrogen Sulphide a black precipitate, and if this precipitate be separated, washed and dissolved in Nitric Acid the solutions should yield the tests distinctive of Bismuth given under Bismuth Carbonate. A small quantity of the salt warmed with a few drops of concentrated Sulphuric Acid evolves violet vapours of Iodine; its Hydrochloric Acid Solution when treated with Chlorine Water and shaken with Carbon Bisulphide, colours the latter violet. A solution in very dilute Hydrochloric Acid gives with Ferric Chloride Test-solution a dark green coloration. It should contain about 46 p.c. by weight of Bismuth Oxide, and about 24·0 p.c. by weight of Iodine.

It should be free from the impurities mentioned under Bismuth Carbonate.

BISMUTHI BETA-NAPHTHOLAS (Orphol). A reddish-brown powder, insoluble in Water. Recommended as an intestinal antiseptic and astringent, both for adults and children.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Experiments with Bismuth Subnitrate and Beta-naphthol as intestinal antiseptics.—*B.M.J.* '95, ii. 1483.

BISMUTHI SUBIODIDUM.—A brick-red amorphous powder, insoluble in Water.

Has been recommended as a substitute for Iodoform in the treatment of chancres and foul ulcers.—*T.G.* '87, 612; *Y.B.P.* '87, 286; *B.M.J.* '89, i. 783.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

BISMUTHI TRIBROMOPHENOLAS (Xeroform).—A yellow powder, insoluble in Water and in Alcohol (90 p.c.). It has been recommended as a non-irritating antiseptic.

Used in wound dressing in the Cuban war.—*L.* '99, i. 1509; and '99, ii. 1459; *B.M.J.E.* '99, ii. 88.

Foreign Pharmacopœias.—Official in Jap., Span. and Swiss. Not in the others.

Tests.—A white curdy precipitate is thrown down when a solution of the powder in Potassium Hydroxide Solution is acidified with diluted Sulphuric Acid, and if this precipitate be separated, washed and dried it should possess a melting point of 95° C. (203° F.). The filtrate from this precipitate should yield the tests distinctive of Bismuth given under Bismuth Carbonate. The powder should yield on ignition from 57 to 61 p.c. of Bismuth Oxide. It should be free from the more generally occurring impurities mentioned under Bismuth Carbonate and the residue remaining after ignition at a dull red heat when moistened with Nitric Acid, again ignited and when cool dissolved in Hydrochloric Acid should yield no reaction for Arsenic when tested by Bettendorf's test.

Bismone (Colloidal Bismuth Oxide); **Bismuthi Iodo-Resorcin-Sulphonas** (Anusol), supplied in Suppository form; **Bismuthi Quinolini Sulphocyanidum** (Crurin); **Bismuthi Cinchonidinæ Iodidum** (Erythrol); **Bismuthi Di-thio-Salicylas** (Thioform); **Bismuthi Oxychloridum, Bismuthi Phosphas,** and **Bismuthi Sulphis,** are combinations of Bismuth, mostly insoluble in Water, which have received notice in Medical Literature.

Not Official.

BOLDO.

The Leaves and young Twigs of the *Peumus Boldus*, Mol., a native of Chili. The activity is due to a Glucoside, Boldine, and a volatile Oil (sp. gr. 0·918).

Foreign Pharmacopœias.—Official in Mex. and Span. Not in the others.

Medicinal Properties.—Has been used as a liver stimulant and as a diuretic; as a stimulant to digestion; also as a hypnotic.—*B.M.J.* '85, ii. 1134; '88, i. 918; gastric stimulant and sedative, antispasmodic, cholagogue.—*B.M.J.E.* '07, ii. 72.

Boldine has been given as a hypnotic in **capsules** containing 3 grains.

TINCTURA BOLDO.—Boldo Leaves, 1; Alcohol (60 p.c.), 10.

Macerate seven days and filter.

Dose.—10 to 40 minims = 0·6 to 2·4 c.c.

This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Mex., 1 and 5; by weight. Not in the others.

BONE MARROW. *See* MEDULLA RUBRA.

BORAX.

BORAX.

B.P.Syn.—BIBORATE OF SODIUM.

FR., BORATE DE SOUDE; GER., NATRIUMBORAT; ITAL., BORATO DI SODIO; SPAN., BORATO SODICO.

$Na_2B_4O_7$, $10H_2O$, eq. 379·12.

Transparent colourless monoclinic prisms, usually efflorescent.

Though this salt is acid in constitution, it gives alkaline reactions with Litmus and Methyl Orange Solutions.

Solubility.—1 in 25 of Water; 2 in 1 of boiling Water; 2 oz. of Borax are dissolved by 2 fl. oz. of Glycerin, and the solution measures only 3¼ fl. oz. By the aid of 1 of Glycerin, 1 part of Borax will dissolve in 12 of Water. Insoluble in Alcohol (90 p.c.).

Borax is decomposed by Glycerin, forming a solution which reddens Litmus paper, and effervesces with Sodium Bicarbonate.

Medicinal Properties.—Antiseptic and parasiticide; mildly astringent. A local sedative to inflamed mucous membrane. As a **lotion** 10 grains to the oz.; as a **gargle** (saturated solution) about 20 grains to the oz., and as an **injection** in leucorrhœa and gonorrhœa. The Glycerin of Borax is used as a **paint** for the throat, for cracked nipples, and for erythematous skin eruptions. The Glycerin or Mel is used in aphthous ulceration of the tongue or buccal mucous membrane, and for mercurial salivation.

Internally in epilepsy (*L.* '93, ii. 1586; '95, ii. 755), but is inferior to Bromide and has many inconveniences.—*B.M.J.E.* '95, i. 4.

Has been recommended by some authorities in epilepsy, but (*L.* '05, i. 710) unless in combination with Bromides it has not been found of much use, although a combination of Borax and Digitalis has been found serviceable in some cases of minor epilepsy.

The effects of Borax on infants.—*L.* '07, ii. 369.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Prescribing Notes.—*For internal use it is generally given in solution. Should not be prescribed with salts of Cocaine or other alkaloids.*

Incompatibles.—Mineral Acids and most of their metallic salts, also alkaloidal salts. Mucilage of Gum Acacia.

Official Preparations.—Glycerinum Boracis and Mel Boracis.

Not Official.—Gargarisma Boracis, Liquor Boracis, Liquor Sodii Boratis Compositus, Lotio Boracis, Nebula Antiseptica Alkalina, Seiler's Antiseptic, Tinctura Myrrhæ et Boracis, Trochisci Boracis, and Unguentum Boracis.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—The distinguishing tests for Sodium Borate are the brown coloration (changing to bluish-black on treatment with alkalis) which its acidified aqueous solution produces with Turmeric paper; the intense yellow coloration which the salt imparts to a non-luminous flame; the white scaly crystalline precipitate thrown down when a hot saturated solution of the salt is acidulated with a mineral acid, and the green coloration imparted to a non-luminous flame when the solution of this precipitate in Alcohol (90 p.c.) is ignited. *U.S.P.*

states that an aqueous solution (1 in 20) after being acidulated with Hydrochloric Acid colours blue Litmus red; yellow Turmeric paper remains unchanged until after drying.

It is officially required to contain 98·57 p.c. of Sodium Pyroborate, as volumetrically determined by titration with Normal Volumetric Sulphuric Acid Solution, using Methyl Orange Solution as the indicator of neutrality; 1 gramme neutralises 5·2 c.c. of the Volumetric Solution. Phenolphthalein Solution is of no use for this titration, and even Litmus Solution gives a rather indefinite end reaction. Although Borax is constitutionally an acid salt, Boric Acid has so little action upon the usual indicators that the Sodium Oxide can be estimated by standard acid just as if no Boric Acid were present. It has been pointed out (*P.J.* '02, i. 345) that inasmuch as the salt is likely to contain Sodium Carbonate, the official process is apt to give erroneous figures. The direct determination of the Boric Acid by a double titration has been suggested. The same number of c.c. of Normal Volumetric Sodium Hydroxide Solution should be required to neutralise the Boric Acid as are required of Semi-normal Volumetric Sulphuric Acid to liberate it, the titration of the free Boric Acid being conducted in 50 p.c. Glycerin Solution. The proportions indicated in the test recommended are:—1 gramme of Borax dissolved in 40 c.c. of Water should require for exact neutralisation 10·55 c.c. of Semi-normal Volumetric Sulphuric Acid Solution, using Methyl Orange Solution as an indicator of neutrality; after boiling and adding 50 grammes of Glycerin, 10·55 c.c. of Normal Sodium Hydroxide Solution should be required to exactly neutralise, Phenolphthalein Solution being employed as the indicator of neutrality. Neither *P.G.* nor *U.S.P.* gives any quantitative test for Borax.

The more generally occurring impurities are Arsenic, Calcium, Copper, Iron, Lead, Magnesium, Bicarbonates, Carbonates and Nitrates, Phosphates, Chlorides and Sulphates. The *B.P.* group these collectively under the usual elastic expression. A standard of 5 parts per 1,000,000 is suggested (*C.D.* '08, i. 726) for Arsenic. Tests for heavy metals, Carbonate and Bicarbonate, Nitrate and Phosphate appear in the *U.S.P.*, but no tests for Calcium, Magnesium, or Sulphate. The *P.G.* includes, in addition to tests for heavy metals, specific tests for Calcium, Iron, Chlorides and Sulphates. A 2 p.c. aqueous solution of the salt when acidified with Hydrochloric Acid should be unaffected by Hydrogen Sulphide Solution, indicating the absence of Arsenic, Copper and Lead. 50 c.c. of a 1 in 50 aqueous solution, after the addition of a few drops of Hydrochloric Acid should not yield an immediate coloration on the addition of 0·5 c.c. of Potassium Ferrocyanide Solution, indicating the absence of more than a faint trace of Iron. The 1 in 50 aqueous solution acidified with Acetic Acid should yield no turbidity on the addition of Ammonium Oxalate Solution, indicating the absence of Calcium; nor when, after standing some time, this solution is filtered, should the filtrate yield on the addition of Ammonium Phosphate Solution a turbidity or precipitate, indicating the absence of Magnesium. The aqueous solution should not effervesce on the addition of mineral acid, indicating the absence of Bicarbonates and Carbonates. A 1 in 50 aqueous solution should not be rendered turbid on the addition of either Silver Nitrate or Barium Nitrate Solution, indicating the absence of Chlorides and Sulphates; nor should it be rendered turbid by Magnesium Ammonio-sulphate Solution, indicating the absence of Phosphates. The *U.S.P.* employs the Indigo test for Nitrates, requiring that if 1 gramme be dissolved in 20 c.c. of diluted Sulphuric Acid, by the aid of heat, and 3 drops of Indigo Test-solution be added, the blue coloration should not be discharged after heating for 10 minutes on a water-bath.

Preparations.

GLYCERINUM BORACIS. Glycerin of Borax.

Borax, 1; Glycerin, 6. (by weight 1 in $8\frac{1}{2}$, measure 1 in $6\frac{1}{2}$)

This is not merely a solution of Borax in Glycerin; the Glycerin splits up the Biborate into free Boric Acid and a more basic Borate with secondary reactions. It reddens blue Litmus paper, and effervesces on the addition of Sodium Bicarbonate.

Dose.—$\frac{1}{2}$ to $1\frac{1}{2}$ fl. drm. = 1·8 to 5·4 c.c.

20 minims given in diarrhœa of infants.—*L.* '89, ii. 739.

Foreign Pharmacopœias.—Official in Mex. (Glicerina Boratada), 1 and 19; Dan. and Norw. (Linctus boracinus), 1 and 9; all by weight. Not in the others.

MEL BORACIS. Borax Honey.

Borax, 2; Glycerin (by weight), 1; Clarified Honey (by weight), 16. (about 1 in 7 by volume)

Foreign Pharmacopœias.—Official in Austr., 1 in 20; Mex. (Colutorio boratado), Borax 1, Honey 1; Swiss, 1 in 10; the ingredients vary slightly. Not in the others.

Not Official.

GARGARISMA BORACIS.—Borax, 1; Water, to 20.—*St Thomas's.*
Borax, 4; Distilled Water, to produce 100.—*B.P.C.*
Borax, 10 grains; Glycerin, 30 minims; Distilled Water, to 1 fl. oz.—*St. George's.*

LIQUOR BORACIS (Thompson's Fluid).—Borax, 1; Glycerin, 2; Water, 2. $\frac{1}{2}$ oz. to be mixed with 4 fl. oz. of warm Water before use.—*Guy's.*

LIQUOR SODII BORATIS COMPOSITUS (Dobell's Solution) (*U.S.N.F.*).—Sodium Borate, 15; Sodium Bicarbonate, 15; Carbolic Acid, 3; Glycerin, 35; Water, *q.s.* to yield 1000.
This has been incorporated in the *B.P.C.*

LOTIO BORACIS.—Borax, 1; Rose Water, 24.
Borax, 1; Glycerin, 1; Rose Water, 16.

SEILER'S ANTISEPTIC.—Sodium Bicarbonate, 8 drm.; Borax, 8 drm.; Sodium Benzoate, 20 grains; Sodium Salicylate, 20 grains; Eucalyptol, 10 grains; Thymol, 10 grains; Menthol, 5 grains; Oil of Wintergreen, 6 minims; Glycerin, $8\frac{1}{2}$ oz.; Alcohol, 2 oz.; Water, to make 256 oz.—*Pharm. Form.*

Nebula Antiseptica Alkalina.—Sodium Bicarbonate, 1; Borax, 1; Sodium Benzoate, 0·04; Sodium Salicylate, 0·04; Eucalyptol, 0·02; Thymol, 0·02; Menthol, 0·01; Oil of Gaultheria, 0·01; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

TINCTURA MYRRHÆ ET BORACIS.—Myrrh, 1; Eau de Cologne, 16; Borax, 1; Water, 3; Syrup, 3.

Borax, 2; Glycerin, 2; Rose Water (undiluted), 24; dissolve and add Eau de Cologne, 48; Tincture of Myrrh (*B.P.* 1885), 96.

Tincture of Myrrh, 37·50; Oil of Bergamot, 0·20; Oil of Lemon, 0·20; Oil of Orange, 0·20; Oil of Neroli, 0·10; Oil of Rosemary, 0·20; Borax, in powder, 2·50; Glycerin, 5; Alcohol, *q.s.* to produce 100.—*B.P.C.*

The *B.P.C. Supplement* alters the quantity of Tincture of Myrrh to 35, and adds 3·5 of Tincture of Krameria.

TROCHISCI BORACIS.—Each Lozenge contains 3 grains of Borax. Sedative.—*Throat.*

This has been incorporated in the *B.P.C.*

UNGUENTUM BORACIS.—Borax, 1; Spermaceti Ointment, 8.

For chilblains or cracked nipples.

This has been incorporated in the *B.P.C.* as follows:—

Borax, in fine powder, 12·50; Spermaceti Ointment, 87·50.—*B.P.C.*

Not Official.

BROMUM.

BROMINE.

FR., BROME; GER., BROM; ITAL., BROMO; SPAN., BROMO.

Br., eq. 79·35.

A heavy, dark red liquid, which evolves dense red, intensely irritating vapours. It is obtained from sea water and from some saline springs.

It should be preserved in dark, amber-tinted glass bottles, provided with closely fitting glass stoppers, and should be kept in a cool place.

Solubility.—In Water, 1 in 30 by weight. Readily soluble in Glycerin, Alcohol (90 p.c.), Ether, Chloroform, and Carbon Bisulphide, with gradual decomposition of the solvents.

Medicinal Properties.—Deodoriser and disinfectant. Used medicinally as a sedative in the form of Bromides and Diluted Hydrobromic Acid.

Official Preparations.—Used to prepare Potassii Bromidum and Sodii Bromidum.

Foreign Pharmacopœias.—Official in Belg., Fr., Ger., Mex. (Bromo), Ital., Jap., Port., Span., Swiss and U.S. Not in Austr., Dan., Dutch, Hung., Norw., Russ. or Swed.

Tests.—Bromine has a specific gravity of 2·97 to 3·14, and a boiling point of about 63° C. (145·4° F.). It should be completely volatilised by heat, without leaving any residue. When treated with Potassium Hydroxide Solution in excess it should form a perfectly clear liquid. If this liquid be rendered faintly acid with diluted Nitric Acid it yields with Silver Nitrate Solution a yellowish precipitate soluble with difficulty in Liquor Ammoniæ, insoluble in Nitric Acid. It gives a yellow coloration to Starch Solution, and decolorises Litmus and Indigo Solutions.

The more generally occurring impurities are mineral matter, organic Bromine compounds, and Iodine. Mineral matter is readily detected by a residue remaining after volatilisation. Organic Bromine compounds are manifested by the failure to produce a clear solution on treatment with an excess of Potassium Hydroxide Solution. Iodine by the blue colour imparted to Starch Solution by an aqueous solution of Bromine, which has been nearly decolorised by the addition of a slight excess of reduced Iron, and to which a small amount of Ferric Chloride has been added.

Bromine is official in the *U.S.P.* and in the *P.G.*; the former stipulates that it shall contain not less than 97 p.c. of pure Bromine, but give no process for its quantitative determination.

HYPOBROMITE SOLUTION FOR UREA-ESTIMATION.—Prepare a stock Solution of Soda (sp. gr. 1·310) by dissolving $3\frac{1}{2}$ oz. of pure Sodium Hydroxide in 9 fl. oz. of Water. To 7 fl. drm. of this add 42 minims (about 114 grains) of Bromine when the Solution is wanted for use.

Note.—*The vapour of Bromine is very irritating to the air-passages. Bromine can be weighed by taking the difference between the weight of the bottle before and after pouring some out, and calculating the quantity of Soda Solution required.*

Glass tubes (hermetically sealed) containing the above quantity of Bromine are made.

In place of 42 minims of Bromine, 2 fl. drm. of the following concentrated solution of Bromine can be used to 6 fl. drm. of the Soda Solution:—

Liquor Bromi Conc.—Bromine, 168 minims = 450 grains; Potassium Bromide, 240 grains; Water, to 1 fl. oz. Mix the Bromine and Potassium Bromide and add the Water gradually with constant stirring until 1 fl. oz. of solution is obtained.

This has been incorporated in the *B.P.C.* as follows:—

Liquor Bromi Fortis.—Bromine, by volume, 33; Potassium Bromide, 54; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

BROMIPIN.—A pale yellow oily liquid. It is a Bromine addition-compound of the fatty acid of Sesame Oil, containing about 33 p.c. of Bromine.

Introduced for the treatment of epilepsy, in doses of 1 fl. drm.

Being difficult to dispense and costly has not met with much success in epilepsy.—*L.* '05, i. 710.

Prescribing Notes.—*It may be given in* **capsules,** *or in* **emulsion** *with Mucilage of Gum Acacia.*

BROMOFORM ($CHBr_3$, eq. 250·96).—A heavy, translucent, colourless, mobile liquid, about twice as heavy as Chloroform. It has a pleasant ethereal odour, and a sweetish taste somewhat resembling Chloroform. The *U.S.P.* defines Bromoform as a liquid consisting of 99 p.c. by weight of absolute Bromoform and 1 p.c. of Absolute Alcohol.

It undergoes change in colour on exposure to the light, and should therefore be kept in well-stoppered dark amber-tinted glass bottles, and should be kept in a cool atmosphere.

Solubility.—1 in 800 of Water, soluble in all proportions of Alcohol (90 p.c.), of Ether, and of Almond Oil; about 1 in 80 of Glycerin.

Dose.—$\frac{1}{2}$ to 3 minims = 0·03 to 0·18 c.c.

Ph. Ger. maximum single dose, 0·5 gramme; maximum daily dose, 1·5 grammes.

Prescribing Notes.—*It is but slightly soluble in Water, and owing to its high sp. gr. it is difficult of suspension, and from this cause accidents have occurred from patients taking an excessive quantity in the last dose of a mixture. For oral administration it is best dissolved in Almond Oil, which can then be put into* **capsules** *or made into an* **emulsion,** *see below.*

It decomposes and becomes yellow on exposure to sunlight, and should not then be dispensed.

Given for the relief of whooping-cough in doses of 2 to 5 drops three or four times a day; in some cases it caused languor and drowsiness, and an over-dose produced toxic symptoms.—*L.* '90, ii. 139; '93, i. 1062; *Pr.* xlv. 47; *T.G.* '90, 694; '91, 214; *B.M.J.* '01, i. 1202, 1543.

Importance emphasised of shaking the mixture containing it, before pouring out dose, and of accurately measuring it.—*B.M.J.* '07, ii. 299.

Foreign Pharmacopœias.—Official in Belg., Dutch, Fr., Ger., Span., Swiss and U.S.

Tests.—Bromoform has a specific gravity of 2·829 to 2·833, a boiling point of 148° C. to 150° C. (298·4° F. to 302° F.), and a solidifying point of 6° C. (42·8° F.). A few drops of Bromoform boiled with Potassium Hydroxide Solution, and the mixture evaporated to dryness on a water-bath, yield a residue, a portion of which dissolved in Water and faintly acidified with diluted Nitric Acid yields with Silver Nitrate Solution a yellowish precipitate insoluble in Nitric Acid, practically insoluble in Ammonia Solution; another portion of the residue when dissolved in Water, acidified with diluted Sulphuric Acid and Chlorine Water added, yields a reddish-brown coloration, and when shaken with Chloroform the reddish-brown colour passes into the chloroformic liquid.

The more generally occurring impurities are mineral matter, free Hydrobromic Acid, Bromides, and Bromine derivatives, free Bromine, and Acetone. Mineral impurity is at once manifested by a residue remaining after evaporation. Free Acid may be detected by the reaction towards Litmus paper, of Water which has been shaken with an equal volume of the sample and allowed to separate. Bromides and Bromine derivatives by the production of a turbidity or precipitate on the addition of Silver Nitrate Solution to the same aqueous menstruum. Free Bromine is detected by the liberation of Iodine from solution of either Cadmium, Potassium, or Zinc Iodide Solution and the subsequent production of a blue colour with Starch Solution. The *U.S.P.* employs Potassium Iodide and Starch Solution, the *P.G.* Zinc Iodide Starch Solution, and the *Belg.* Cadmium Iodide Starch Solution. Acetone may be detected by the formation of Iodoform, when the aqueous layer separated after shaking together equal volumes of the sample and Water, is treated first with Ammonia Solution in excess and then with Iodine and Ammonium Iodide Solution. A test for this impurity is included in the *U.S.P.*, but not in the *P.G.* The *P.G.* states that when equal parts of Bromoform and Sulphuric Acid are shaken together, in a vessel which has been rinsed with Sulphuric Acid, no coloration of the Acid shall take place within 10 minutes. No such test appears in the *U.S.P.*

Emulsio Bromoform.—Bromoform, 40 minims; Almond Oil, 70 minims; Gum Acacia, 40 grains; Syrup, 100 minims; Distilled Water, to 1 fl. oz. Dissolve the Bromoform in the Oil of Almonds and emulsify in the usual way.

One minim is contained in 6 minims of the Emulsion.

Dose.—5 to 20 minims = 0·6 to 1·2 c.c.

Mistura Bromoformi.—Bromoform, 12 minims; Almond Oil, 60 minims; Powdered Gum Acacia, 120 grains; Simple Syrup, 240 minims; Water, to make 3 fl. oz. Dissolve the Bromoform in the Almond Oil, rub this with the Powdered Gum Acacia, add 3½ fl. drm. of Water and rub into a paste, gradually add the remainder of the Water, and finally the Syrup.

One minim is contained in 2 fl. drm. of the Mixture.

Dose.—1 to 4 fl. drm. = 3·6 to 14·2 c.c.

BROMETHYLFORMINE (Bromaline).—A white crystalline, almost odourless powder. Has been recommended as a sedative in epilepsy.

Solubility.—2 in 1 of Water; 1 in 28 of Alcohol (90 p.c.); insoluble in Ether and in Chloroform.

Dose.—5 to 30 grains = 0·32 to 2 grammes.

Tests.—Bromethylformine dissolves readily in Water, forming a clear neutral solution. The aqueous solution when gently warmed with Sodium Hydroxide Solution yields on the addition of a slight excess of Iodine a strong characteristic odour of Iodoform. When Bromine Water is added in excess an orange-red precipitate is thrown down, the precipitation being more pronounced in strong solutions. When boiled with Sodium Hydroxide Solution it evolves Ammonia gas readily recognised by its odour and by its action on red Litmus paper. If the liquid be now cooled, acidified with Sulphuric Acid, and again boiled, it evolves the characteristic irritating odour of Formaldehyde. Boiled with Sodium Hydroxide Solution, cooled, and acidified with dilute Nitric Acid, it yields with Silver Nitrate Solution, a yellowish precipitate practically insoluble in Ammonia Solution, insoluble in Nitric Acid; when dissolved in Sulphuric Acid a yellowish-brown coloration, which passes into solution when shaken with Chloroform. It leaves no residue when ignited with free access of air.

Not Official.

BRYONIA.

The Root of *Bryonia alba*, L., and of *Bryonia dioica*, Jacq.

Medicinal Properties.—In large doses it is an active hydragogue cathartic, in small doses it is given in pleurisy. It has also been used as a hæmostatic in menorrhagia.—*L.* '88, ii. 438.

It has been used for many years by the homœopaths in the form of **tincture.** The active principle is a glucoside.

Foreign Pharmacopœias.—Official in Mex. and Port. Not in the others.

Descriptive Notes.—The root of *Bryonia dioica*, Jacq., is usually the kind met with in commerce. It occurs in circular transverse slices of a yellowish-white colour, about 1½ to 3 inches (37 to 75 mm.) or more in diameter and ¼ to ⅓ inch (6 to 8 mm.) thick. The narrow bark, which is a very pale brown externally, is separated from the fleshy centre by a fine line, and the cut surface is marked with concentric rings, and with radiating lines of vascular tissue. The dried root has no definite odour, but has a bitter and acrid taste. The fresh root, which is often as much as 2 feet (60 cm.) long and 3 inches (75 mm.) in diameter at the upper end, is occasionally offered by gardeners under the name of Mandrake root. In homœopathic medicine, the root of *Bryonia alba* is preferred, and is imported from Germany. The plant is distinguished from *Bryonia dioica* by having monœcious flowers and black berries. The plant contains Brein, a glucoside not found in *B. dioica*, and the root is considered to have a different medicinal action; it is stated by Petresco to be not purgative.

TINCTURA BRYONIÆ.—Made from fresh Bryony Root of such a strength that 10 fl. oz. shall represent 1 oz. of the dried root and shall contain 60 p.c. by volume of Alcohol.—*B.P.C. Formulary* 1901.

Fresh Bryony Root yields on an average 32 to 40 p.c. of dried root.

Dose.—1 to 10 minims = 0·06 to 0·6 c.c.

This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Mex., 1 and 5, **dried Root.**

Antidotes.—An emetic; stimulants, Brandy or Spirit of Sal Volatile.

BUCHU FOLIA.

BUCHU LEAVES.

N.O.Syn.—Bucco; Diosma.

Fr., Feuilles de Bucco; Ger., Buccoblätter.

The dried leaves of *Barosma betulina*, contain a volatile oil, a bitter principle, and a mucilage.

Medicinal Properties.—Tonic, stomachic, diuretic, and diaphoretic. Given chiefly in complaints of the urinary organs, as an antiseptic in chronic cystitis, and in irritation of the bladder and urethra. Also in dyspepsia, chronic rheumatism, and dropsy.

Dose.—Usually given in the form of Infusion or Tincture, *q.v.*

Official Preparations.—Infusum Buchu and Tinctura Buchu.

Not Official.—Fluidextractum Buchu, Infusum Buchu Concentratum, Mistura Buchu Composita.

Foreign Pharmacopœias.—Official in Jap., Mex., Port. and U.S. Not in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Norw., Russ. Span., Swed. or Swiss.

Descriptive Notes.—The dried leaves of *Barosma betulina*, Bart. and Wendl., are alone official. These are easily distinguished from the leaves of *B. serratifolia*, Willd., and *B. crenulata*, Hook., which were formerly official, and are still to be met with in commerce, by their obovate shape and recurved obtuse apex. The oil glands on the toothed margin of the leaf and its size (which is given in *B.P.* as $\frac{1}{2}$ to $\frac{3}{4}$ inch, or 12 to 20 mm., in length), and the layer of mucilaginous cells below the epidermis and the yellow crystals of hesperidin contained in the epidermal cells, are useful characters for distinguishing Buchu from other leaves. The oil of the leaves *B. betulina* deposits crystals of Diosphenol, to which the antiseptic properties of the leaves are probably due; this is not the case with the Oil from the other species. Diosphenol has an odour like Menthol. The official leaves have also the advantage that they cannot be mistaken, like those of *B. serratifolia* and *B. crenulata*, for the leaves of any other species, on account of their very characteristic shape.

Tests.—Buchu Leaves yield about 5 p.c. of ash on ignition, and 6 p.c. is seldom exceeded. 12 samples examined in the author's laboratory yielded from 3·6 to 5·68 p.c., with an average of 4·52 p.c.

Preparations.

INFUSUM BUCHU. Infusum of Buchu.

Buchu, 1; boiling Distilled Water, 20; infuse 15 minutes. (1 in 20)

Dose.—1 to 2 fl. oz. = 28·4 to 56·8 c.c.

Not in the other Pharmacopœias.

TINCTURA BUCHU. Tincture of Buchu.

1 of Buchu Leaves, in No. 20 powder percolated with Alcohol (60 p.c.) to yield 5. (1 in 5)

Dose.—$\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Mex., 1 and 5; both by weight. Not in the others.

Tests.—Tincture of Buchu has a sp. gr. of 0·925 to 0·935; it contains about 4 p.c. w/v of total solids and about 58 p.c. of Absolute Alcohol.

Not Official.

FLUIDEXTRACTUM BUCHU.—Macerate 100 of Buchu in No. 60 powder with 40 of a mixture of Alcohol (95 p.c.) 3 and Water 1, and percolate with more of the mixture until the drug is exhausted. Reserve the first 85 of the percolate and evaporate the remainder at a temperature not exceeding 50° C. (122° F.) to a soft extract, dissolve this in the reserved portion and add enough menstruum to make 100.—*U.S.P.*

INFUSUM BUCHU CONCENTRATUM.—Buchu Leaves, bruised, 40; Tincture of Buchu, 22·5; Alcohol (90 p.c.), 10; Dilute Chloroform Water (1 in 1000), *q.s.* to make 100. Prepare by macero-expression. Dose.—1 to 2 fl. drm.—*Farr* and *Wright; P.J.* '06, i. 165; '07, i. 621; *C.D.* '06, i. 252; *Y.B.P.* '07, 249.

The authors state that it keeps well, but the product of dilution is not equal to the fresh infusion.

This appears in the *B.P.C.*

MISTURA BUCHU COMPOSITA.—Potassium Citrate, 30 grains; Tincture of Hyoscyamus, 30 minims; Infusion of Buchu, to 1 fl. oz.—*Charing Cross.*

Potassium Bicarbonate, 15 grains; Tincture of Hyoscyamus, 20 minims; Spirit of Chloroform, 10 minims; Infusion of Buchu, to 1 fl. oz.—*King's.*

Potassium Citrate, 20 grains; Tincture of Hyoscyamus, 15 minims; Infusion of Buchu, to 1 fl. oz.—*St. Thomas's.*

The last has been incorporated in the *B.P.C.*

BUTYL-CHLORAL HYDRAS.

BUTYL-CHLORAL HYDRATE.

$C_4H_5Cl_3OH_2O$, eq. 191·97.

White crystalline scales of a silky lustre, with a somewhat fruit-like but disagreeable odour and bitter nauseous taste.

Butyl-Chloral Hydrate, formerly known as Croton-Chloral Hydrate, is, chemically, Trichlorbutylidene Glycol, and is prepared by acting upon Aldehyde or, preferably, Paraldehyde with Chlorine gas. It should be preserved in well-stoppered amber-tinted glass bottles.

Solubility.—1 in 44 of Water; 1 in 1 of Glycerin (very slowly); 5 in 3 of Alcohol (90 p.c.); 1 in 20 of Olive Oil; 1 in 2 of Ether; 1 in 20 of Chloroform.

Some books give the solubility as 4 in 1 of Glycerin, but this is incorrect.

Medicinal Properties.—Analgesic; is frequently but not always an efficient remedy in neuralgia of the face and head, and in tic-douloureux. As a hypnotic it is seldom used, being weaker and less certain than Chloral Hydrate.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Prescribing Notes.—*Generally given in the form of pills made with a little Compound Powder of Tragacanth and Syrup. The addition of Alcohol or Glycerin to aqueous mixtures increases its solubility.*

Not Official.—Mistura Butyl-Chloral, Pilula Butyl-Chloral, Pilula Butyl-Chloral cum Gelsemio, Syrupus Butyl-Chloral.

Antidotes.—The same as for Chloral Hydrate.

Tests.—The distinguishing tests for Butyl-Chloral Hydrate are its melting point, about 78° C. (172·4° F.), and which is officially required to be about 77·8° C. (172° F.), and its solidifying point, which should be, according to the *B.P.*, about 71·1° C. (160° F.). Some samples are acid, very pungent and acrid. Of these the author found that 1 gramme heated in a porcelain capsule over a water-bath for 10 minutes wholly volatilised; but the sample lost its pungency and acridity after having been washed with about twice its weight of Water, pressed, and dried by exposure to air, and when heated as above lost less than half its weight. The slow volatility of a sample may therefore be taken as a test of purity. An acrid sample by washing and drying had its melting point raised from 73·9° C. (165° F.) to 78·9° C. (174° F.). When warmed with concentrated Sulphuric

Acid, Trichlorbutyl-aldehyde separates out in oily drops. The aqueous solution of Butyl-Chloral Hydrate reduces Silver Ammonio-nitrate Solution.

The more generally occurring impurities are free acid, Chloral Hydrate, and Chlorine derivatives. The behaviour of the aqueous solution towards blue Litmus paper affords a measure of the free acid; the non-production of a turbidity with Silver Nitrate Solution indicates the absence of free Hydrochloric Acid or Chlorine derivatives, and should the sample evolve no odour of Chloroform when heated with Calcium, Potassium, or Sodium Hydroxide Solution, the absence of Chloral Hydrate may be inferred.

Its behaviour when gently warmed with concentrated Sulphuric Acid affords an additional test for Chlorine derivatives. Thus treated the liquid should not turn brown. The *B.P.* says nothing respecting these Chlorine derivatives, only testing for freedom from acidity and Chloral Hydrate; the aqueous solution is required to be neutral or but slightly acid to Litmus; the salt should leave no weighable residue when ignited with free access of air.

Not Official.

MISTURA BUTYL-CHLORAL.—Butyl-Chloral Hydrate, 5 grains; Glycerin, 15 minims; Chloroform Water, ½ fl. oz.; Water, to 1 fl. oz.

This has been incorporated in *B.P.C.* as follows:—

Butyl-Chloral Hydrate, 4½ grains; Glycerin, 15 minims; Chloroform Water, 240 minims; Distilled Water, *q.s.* to make 1 fl. oz.—*B.P.C.*

PILULA BUTYL-CHLORAL.—Butyl-Chloral Hydrate, 5 grains; Compound Powder of Tragacanth, 1 grain; Syrup *q.s.*; in 1 pill.

PILULA BUTYL-CHLORAL CUM GELSEMIO.—Butyl-Chloral Hydrate, 3 grains; Alcoholic Extract of Gelsemium, 1 grain.—*Guy's* and *Sheffield Union.*

PILULA BUTYL-CHLORAL ET GELSEMINÆ.—Butyl-Chloral Hydrate, 3 grains; Gelseminæ Hydrochloridum, $\frac{1}{200}$ grain; Pulvis Tragacanthæ Compositus, 1 grain; Syrupi Glucosi *q.s.*—*Westminster.*

SYRUPUS BUTYL-CHLORAL.—Butyl-Chloral Hydrate, 16 grains; Syrup, *q.s.* to make 1 fl. oz.; dissolve by the aid of heat.—*B.P.C. Formulary* 1901.

This has been incorporated in the *B.P.C.*

Dose.—1 to 4 fl. drm. = 3·6 to 14·2 c.c.

Not Official.

BYNE. MALT.

Good Malted Barley is tolerably uniform in diastase, and the widely differing results published from time to time by different analysts as to the strength of commercial Extracts must be due partly to a destruction of diastase in the manufacture of the Extracts, and partly to an ambiguity attaching to the phrase 'conversion of Starch.'

EXTRACTUM BYNES. *Syn.* EXTRACTUM MALTI. MALT EXTRACT.

Is made by infusing or mashing ground Malt in Water at a temperature under 160° F., preferably 140° F., filtering and evaporating the solution *in vacuo* to the consistence of a thick syrup. It is more convenient to use when it is evaporated only to a thin syrup, but in that condition the Extract is more liable to undergo fermentation.

Medicinal Properties.—Malt Extract is prescribed as a nutrient in wasting diseases, and where the digestion is weak it is given for its diastasic value of converting Starch into Maltose and Dextrin. It is also given with Cod Liver Oil. It is useful for covering the taste of nauseous drugs.

Dose.—A teaspoonful to a tablespoonful, immediately after food.

Hale White states, 'like the ferments of pancreatic juice and saliva, diastase can only act in an alkaline medium, and therefore extract of malt should not be given till at least two hours after a meal.'—*Hale White Mat. Med.* But the usual custom of most prescribers is probably that expressed in the following reasoned statement of the *B.M.J.* '08, i. 363:—

Malt Extract is prescribed with one of two objects: (1) To increase the supply of carbohydrates in the diet. When given for this purpose it is a matter of indifference at what hour it is taken, and the choice may well be left to the individual taste of the patient. (2) To help in the conversion of starch into sugar by means of the diastase it contains. The contents of the pyloric half of the stomach become acid at a very early stage in digestion. Those of the cardiac half are alkaline for a considerable period, so that amylolytic digestion may continue in the latter after a full meal for an hour or more. The first part of a meal finds its way into the pyloric half; the second part remains in the cardiac half until the former passes into the duodenum. Hence if the latter part of a meal is largely starchy, malt extract taken with it or immediately after it helps in the conversion of starch into sugar. If taken an hour or more after the meal the Malt will be useless, as the contents of all parts of the stomach are then acid.

It is very useful when mixed with baked wheaten flour to form foods for infants and invalids when a certain amount of pre-digestion is required.

For a substance with similar properties *see* TAKA-DIASTASE.

Foreign Pharmacopœias.—The *U.S.P.* 1882 ordered the Malt to be macerated in cold Water for six hours, then digested for an hour at 131° F., strained and evaporated at a temperature not exceeding 131° F. to the consistence of Honey. This contained active diastase. It was omitted in *U.S.* 1893. It was re-introduced in *U.S.P.* 1905 as follows:—

Extractum Malti.—Upon 1000 grammes of Malt in coarse powder (not finer than No. 12), contained in a suitable vessel, pour 1000 c.c. of Water, and macerate for six hours. Then add 4000 c.c. of Water, heated to about 30° C. (86° F.), and digest for an hour at a temperature not exceeding 55° C. (131° F.). Strain the mixture with strong expression. Finally, by means of a water-bath, or vacuum apparatus, at a temperature not exceeding 55° C. (131° F.), evaporate the strained liquid rapidly to the consistence of thick Honey.

This has been incorporated in the *B.P.C.*

Test.—For Malt or Malt Extract, three solutions, *A*, *B*, and *C*, are required. (*A*) Infuse 5 grammes of ground Malt in 100 c.c. of Water at 140° F. (60° C.) for one hour, cool to 60° F. (15·5° C.), and make up to 100 c.c with Water; filter. For testing Malt Extract, dissolve 5 grammes of the Extract in sufficient Water to make 100 c.c. of solution. (*B*) Mix 1 gramme of Potato Starch with 10 c.c. of Water, add to it 90 c.c. of boiling Water; boil the mixture for ten minutes; cool to 60° F. (15·5° C.) and make up to 100 c.c.; strain through fine muslin. (*C*) Dilute 1 c.c. of *B.P.* Volumetric Solution of Iodine to 75 c.c. with Water.

Method.—Run 2 c.c. of the Iodine Solution into each of one dozen test-tubes. Bring solution *A* and solution *B* to 100° F. (37·8° C.); place 50 c.c. of *B* in a beaker immersed in Water at 100° F. (37·8° C.), and add to it 10 c.c. of *A*; at the end of a minute draw off 2 c.c. of the mixture and add it to the Iodine Solution in one of the test-tubes, and at the end of each subsequent minute repeat the operation. If the test-tubes are arranged in the order in which the solution is added, the colour in each test-tube will represent the amount of action in a given time represented by minutes. As it occupies from ten to fifteen seconds to run the Malt Solution from a pipette into the Starch, we usually start the stop-watch or chronograph when half of the solution has run out of the pipette. When a first-class sample of Malt Extract is used, the contents of the first test-tube will be of a blue colour, the second will be red, and the third or fourth yellow, but the changes will be somewhat slower in a sample which is not so good.

Six of the best known brands of Malt Extract examined by this test ceased to produce a red colour at the end of three, four, six, eight, fourteen, and fifteen minutes respectively, showing a variation of from three to fifteen minutes, in the digestion of *their own weight* of Starch. A fluid Malt Extract, containing Alcohol, ceased to give a red colour at the end of thirty-five minutes.

The best sample, when treated with *five times* its weight of Starch, ceased to produce a red colour at the end of fourteen minutes.

It is important that the conditions should be the same in each experiment, for any variation in the quantity of Iodine Solution to the volume of liquid employed will affect the results, but under the conditions given, when the colours are viewed in series, two independent workers should not vary more than 1 minute in the reading.

This process has been found (*Suggested Standards of Purity for Foods and Drugs*, p. 184) useful and convenient, but it is mentioned that it might have been better to adopt a standard time and vary the proportion of Starch. This suggestion would render the process much less convenient, and the amount of Starch digested in a Standard time can easily be calculated by a simple formula, the activity of Malt Diastase towards Starch Solution, unlike Pancreatic Diastase (Amylopsin), being inversely proportional to the amount of enzyme present. A more striking contrast is, moreover, obtained by taking the relative time required by different samples to digest a definite weight of Starch.

LIQUID MALT.—Malt Extract, sp. gr. 1·375, to which diluted Alcohol is added, sufficient to produce a liquid, sp. gr. 1·250, containing 7·3 p.c. of Alcohol (90 p.c.) by weight, equal to about 15 p.c. Proof Spirit.

Preparations somewhat similar to this are sold as **Fluid Extract of Malt, Bynin,** etc.

Liquid Malt Extract.—Extract of Malt (sp. gr. 1·375), by volume, 68; Alcohol (90 p.c.), 7·50. Distilled Water, *q.s.* to produce 100.—Mix to form a liquid sp. gr. 1·2.—*B.P.C.*

FLUIDEXTRACTUM MALTI (*U.S.N.F.*).—Malt in coarse powder, 100, percolated with a mixture of Alcohol (94 p.c.) 1 and Water 3, until the percolate weighs 75.

MALT EXTRACT WITH COD LIVER OIL.—This is supplied under several well-known brands, but can be prepared extemporaneously by thinning ordinary Malt Extract with 10 to 15 p.c. of Water, heating the mixture to 120° F., adding the oil and shaking thoroughly until mixed. The commercial product contains from 20 to 30 p.c. of Cod Liver Oil.

Examination of commercial samples gave from 20 to 30 p.c. of Oil by volume.—*P.J.* (3) xxv. 162.

Prescribing Note.—*Usually given in milk.*

EXTRACTUM MALTI CUM OLEO MORRHUÆ (*B.P.C.*).—Extract of Malt, 17 fl. oz.; Cod Liver Oil, 3 fl. oz. Heat the Extract to 110° F., and pour it into a warm mortar; add the Oil gradually and with constant trituration.—*B.P.C. Formulary* 1901.

B.P.C. incorporates this formula without heating the extract.

EXTRACTUM MALTI FERRATUM.—Iron Pyrophosphate, 2; Water 3. Dissolve and add Extract of Malt, 95.—*Guy's.*

Dose.—1 to 4 drm. = 3·6 to 14·2 c.c.

Each fl. drm. contains about 1 grain Iron Pyrophosphate.

TAKA-DIASTASE.—A powder of a light brown colour, possessing a nutty taste. Derived from a fungus of the species *Eurotium Oryzæ.* It possesses high diastasic properties, readily converting over a hundred times its weight of Starch at body temperature.

Specially indicated as an artificial digestant of starchy food in dyspepsia cases in which there is a deficiency of saliva. Also found useful in hyperacidity of the stomach and in gouty dyspepsia.—*L.* '96, i. 856; '03, ii. 1052; *A.J.P.* '98, 138.

Most useful in gouty dyspepsia; it encourages the digestion of carbohydrates and so prevents the development of fatty acids which, by their irritating effects, are so common a factor in the development of gouty dyspepsia; a 2½ grain tablet before each meal.—*Pr.* '07, i. 168.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme, in capsules in the middle of or immediately after a meal.

Diastase from Malt is official in Fr., Jap., Mex. and Span.

CADINUM OLEUM.

OIL OF CADE.

B.P.Syn.—JUNIPER TAR OIL.

FR., HUILE DE CADE; GER., KADEÖL; ITAL., OLIO CADINO; SPAN., BREA DE OXICEDRO.

A brownish or dark brown, viscid fluid, of an oily nature, with a tarry odour and an empyreumatic and somewhat bitter taste; a product of the dry distillation of the Branches and Wood of *Juniperus Oxycedrus*, L., and other species. It contains a high percentage of the sesquiterpene, Cadinene.

Solubility.—Mixes in all proportions with Chloroform and Ether; partially soluble in Alcohol (90 p.c.); slightly soluble in Water.

Medicinal Properties.—An agreeable form of Tar. Used as a stimulant in cases of psoriasis and of chronic eczema.

Prescribing Notes.—*It is used in the form of Ointment; the Oil mixed with equal parts of Yellow Wax, and further diluted with Lard or Vaseline if required.*

Foreign Pharmacopœias.—Official in Austr., Dan., Dutch, Hung., Ital., Norw., Port., Span. (Brea de Oxicedro), Russ., Swed. (Pyroleum Oxycedri), Swiss and U.S. Not in the others.

In **Balzer's Cade Baths** the oil is emulsified before being added to the bath. An emulsion of Oil of Cade and a fluid extract from the decoction of the tops of the Taunus Pines. The baths are given daily, and can be used in all varieties of psoriasis.

Cade Bath Fluid is put up in bottles, one of which, being mixed with a little warm Water, is added to an ordinary bath, which should last from half an hour to an hour, and should be accompanied by slight friction on the affected patches.

These baths may be used as an adjuvant to the ordinary treatment, and are suitable both for hospital and private cases.

Tests.—Oil of Cade has a specific gravity of about 0·990. When shaken with Water and filtered it should yield an almost colourless filtrate possessing an acid reaction. In a sample (sp. gr. 0·996), examined by the author, the acidity amounted to 0·7 p.c. of pure Acetic Acid.

The filtered aqueous solution should yield a red coloration with diluted Ferric Chloride Test-solution.

The *B.P.* states that the filtered aqueous solution is almost colourless and possesses an acid reaction; and the *U.S.P.* that it imparts to Water an acid reaction.

VASOLIMENTUM EMPYREUMATICUM. — Juniper Tar Oil, 25; Vasoliment, 75.—*Hager.*

Parogenum Empyreumaticum.—Oil of Cade, 25; Parogen, 75.—*B.P.C.*

CAFFEINA.

CAFFEINE.

B.P.Syn.—THEINE.

N.O.Syn.—COFFEINA.

FR., CAFEINE; GER., KOFFEIN; ITAL., CAFFEINA; SPAN., CAFEINA.

$C_8H_{10}N_4O_2$, H_2O, eq. 210·68.

Fine white silky acicular crystals, odourless, and possessing a bitter taste.

A feebly basic alkaloid, contained in the prepared and dried Leaves of *Camellia Thea*, Link., the dried seed of *Coffea Arabica*, L., and also in other plants. It is chemically allied to Theobromine, being **Methyl-theobromine** (Trimethyl-xanthine).

The quantities yielded are about as follows: Tea Leaves, 3 to 4 p.c., Coffee Seeds, 1 p.c.; Guarana, 5 p.c.; Maté or Paraguay Tea, 1 p.c.; Kola Nut, 2 to 3 p.c.

Solubility.—1 in 68 of Water; 1 in 40 of Alcohol (90 p.c.); 1 in 7 of Chloroform; 1 in 400 of Ether; 1 in 1 of boiling Water.

Medicinal Properties.—A valuable heart tonic and diuretic, especially in cases of loss of compensation with cardiac dropsy. To be given with caution in the presence of renal disease.

Given in 1 grain doses every hour for migraine and hemicrania; also in the form of **Effervescent Caffeine Citrate** (1 grain in each drm.).

It is eliminated but slowly by the kidneys, and its action on the heart is cumulative.—*B.M.J.E.* '00, i. 35.

Used by malingering soldiers to produce symptoms of cardiac disease.—*L.* '00, i. 1406.

Diuretic action of *Caffeine* and *Theobromine.*—*B.M.J.* '01, ii. 7.

Specially valuable in spasmodic asthma and allied affections. In 5-grain doses every four hours.—*Pr.* liv. 318.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

Ph. Ger. maximum single dose, 0·5 gramme; maximum daily dose, 1·5 grammes.

Prescribing Notes.—*Given in* **cachets**, *in* **mixtures**, *or in pills made with 'Diluted Glucose'; also in the form of* **effervescent preparations.** *For hypodermic use* 20 *grains can be dissolved in* 60 *minims of Water by the aid of* 20 *grains of Sodium Salicylate, or* 20 *grains of Sodium Benzoate. See also Caffeinæ Sodio-Salicylas, and Caffeinæ Sodio-Benzoas.*

Official Preparations.—Caffeinæ Citras, Caffeinæ Citras Effervescens.

Not Official.—Elixir Caffeinæ, Caffeinæ Hydrobromidum, Caffeinæ Di-iodi-Hydriodidum, Caffeinæ Sodio-Benzoas, Caffeinæ Sodio-Salicylas, Caffeinæ Valerianas, Æthoxycaffeinum.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger. (Koffein), Hung., Ital. (Caffeina), Jap., Mex., Port., Russ., Span. (Cafeina), Swed., Swiss and U.S. Not in Norw.

Tests.—The distinguishing test for Caffeine is the Murexide test which consists in dissolving the alkaloid in a small quantity (about ½ to 1 c.c.) of concentrated Hydrochloric Acid, adding a crystal of Potassium Chlorate and evaporating the mixture to dryness on a water-bath. When the residue is subjected to the action of Ammonia gas or is moistened with a little Ammonia Solution, a fine purple coloration is produced. The colour is not affected by an excess of Ammonia, but is immediately discharged by a fixed alkali. A similar coloration is produced when the test is performed with Chlorine or Bromine Water in place of Potassium Chlorate and Hydrochloric Acid; Chlorine Water is used in the *P.G.* test. The usual alkaloidal reagents precipitate Caffeine only imperfectly. Neither Mercuric-potassium Iodide (Mayer's) Solution nor Iodo-potassium Iodide (Wagner's) Solution precipitate Caffeine from neutral solutions; this non-precipitation serving to distinguish Caffeine from other official alkaloids. If the Iodo-potassium Iodide Solution is preceded or followed by the addition of some dilute mineral acid, a dark-reddish precipitate is at once thrown down. Upon this reaction is based (*C.N.* '97, 99) a method for the determination of Caffeine. Tannic Acid produces a white precipitate in moderately dilute solutions, but the extent of the reaction is largely dependent on the temperature.

Caffeine is completely extracted by Chloroform from a slightly acid or slightly ammoniacal aqueous solution, and is the solvent generally employed in its gravimetric determination. It dissolves without colour in Sulphuric and in Nitric Acids. It melts, when anhydrous at 231·5° C. (448·7° F.). No melting point is given in the *B.P.* The *P.G.* gives 230·5° C. (446·9° F.), and the *U.S.P.* 236·8° C. (458·3° F.) after drying till constant in weight at 100° C. (212° F.). Theoretically, it should contain 8·49 p.c. of Water, and the *B.P.* states that the crystals lose this amount at 100° C. (212° F.); but commercial Caffeine generally loses about 7 p.c. on drying. It has been pointed out (*P.J.* '00, ii. 148) that the Pharmacopœia errs in its method of expression, as commercial Caffeine probably never contains 8·49 p.c. of Water, owing to the facility with which the crystals effloresce. The *P.G.* states that in the air Caffeine loses 1 part of its Water of crystallisation and at 100° C. (212° F.) it becomes anhydrous. The sublimation point is given in the *P.G.* as 180° C. (356° F.), in the *U.S.P.* as 178° C. (352·4° F.). The *B.P.* says that 'at a higher temperature than 100° C. (212° F.) it melts and volatilises without decomposition.' It has been shown (*P.J.* (3) xxiii. 213) that Caffeine which has been dried at the ordinary temperature over Sulphuric Acid till constant in weight undergoes no further material loss on prolonged exposure in an open dish in the water-oven at 100° C. (212° F.), and that it does not volatilise with steam during the evaporation of its solutions.

The more generally occurring impurities are alkaloids other than Caffeine, organic impurities and mineral matter. The presence of alkaloids other than Caffeine is shown by the formation of a precipitate with Mercuric-potassium Iodide (Mayer's) Solution or Iodo-potassium Iodide Solution; organic impurities by the production of coloured solutions in Sulphuric Acid, and mineral matter by a residue remaining after sublimation.

Potassium Chlorate and Hydrochloric Acid.—A small quantity of Caffeine is dissolved in 1 c.c. of Hydrochloric Acid in a porcelain dish, a little Potassium Chlorate is added and the whole evaporated to dryness on a water-bath; the dish is then inverted over a vessel containing a few drops of Ammonia Water, the residue acquires a rich purple colour which is destroyed by fixed alkalis, *U.S.P.* A similar test is given in the *P.G.*, but Chlorine Water is used instead of Potassium Chlorate and Hydrochloric Acid. One part of Caffeine with 10 parts of Chlorine Water are evaporated on a water-bath and yield a yellowish-red residue, which on moistening with a little Ammonia Solution becomes coloured a rich purple. The *B.P.* simply evaporates an indefinite quantity of Caffeine with Potassium Chlorate and a few drops of Hydrochloric Acid.

Potassium Dichromate and Sulphuric Acid.—If a fragment of Caffeine be dissolved in Sulphuric Acid, and a minute fragment of Potassium Dichromate be added to the liquid, a yellowish-green colour which gradually becomes green will be produced, *U.S.P.*

Chlorine Water.—A cold saturated aqueous solution of Caffeine should not become turbid with Chlorine Water, *P.G.*

Iodine Solution.—A cold saturated aqueous solution should not become turbid with Iodine Solution, *P.G.*

Ammonia Solution.—A cold saturated aqueous solution should not become coloured on the addition of Ammonia Solution, *P.G.*

Sulphuric Acid or Nitric Acid.—*P.G.* and *U.S.P.* require that Caffeine should dissolve without coloration in Sulphuric Acid or in Nitric Acid. The *P.G.* uses 0·1 gramme of Caffeine and 1 c.c. of either Acid.

Preparations.

CAFFEINÆ CITRAS. CAFFEINE CITRATE.

An unstable combination of Caffeine and Citric Acid, which readily undergoes dissociation in the presence of Water.

A fine white, odourless powder possessing an acid and somewhat bitter taste; prepared by stirring one part of Caffeine into a heated solution of 1 part of Citric Acid and 2 parts of Distilled Water, the mixture being subsequently evaporated to dryness on a water-bath and kept constantly stirred towards the end of the evaporation. It is then reduced to powder.

Solubility.—1 in 32 of Water; 1 in 22 of Alcohol (90 p.c.); 1 in 10 of a mixture of 2 parts Chloroform with 1 part Alcohol (90 p.c.).

When combined with Sodium Benzoate, it acted rapidly and efficaciously in a case of tricuspid incompetency.—*M.P.* '04, ii. 515.

Dose.—2 to 10 grains = 0·13 to 0·65 gramme.

Foreign Pharmacopœias.—Official in Hung., Mex., Span. (Citrato Cafeico), Swiss and U.S. Not in the others.

Tests.—Caffeine Citrate should afford the reactions distinctive of Caffeine appearing in the large type under that substance. The aqueous solution, after neutralisation and separation of the Caffeine by shaking with Chloroform, yields with Calcium Chloride Solution a white precipitate insoluble in Potassium Hydroxide Solution; with Silver Nitrate Solution a white precipitate soluble in Ammonia Solution, which is distinguished from Tartrate by yielding no mirror on boiling. The salt is official in *B.P.* and *U.S.P.*, but not in *P.G.* Neither *B.P.* nor *U.S.P.* gives any process for ensuring the presence of the requisite proportion of Caffeine. It should contain not less than 50 p.c. by weight of Caffeine as gravimetrically determined by rendering an aqueous solution of the salt faintly alkaline with Potassium or Sodium Hydroxide Solution and shaking out the Caffeine with successive quantities of Chloroform. The mixed chloroformic solutions are evaporated to dryness and the residue dried till constant in weight at 100° C. (212° F.) and weighed. The Swiss Pharmacopœia states that it shall contain not less than 50 p.c. nor more than 75 p.c. of Caffeine.

The Citric Acid may be determined by direct titration with Normal Volumetric Potassium or Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. Caffeine is so feebly basic that it exercises no influence on the indicator. Theoretically it should contain about 50 p.c. of Citric Acid.

The *U.S.P.* states that 1 part of Caffeine forms a clear syrupy solution with about 4 parts of hot Water, which is correct, and agrees with the Swiss Pharmacopœia statement, 'soluble' in 4 parts of hot Water. On dilution with 5 parts of Water a white crystalline precipitate separates which redissolves when about 25 parts of Water have been added. The *B.P.* states that 'with 3 parts of Water it forms a clear syrupy solution,' which is incorrect; but more Water dissociates the salt and affords a white precipitate of Caffeine, which redissolves when excess of Water is added. It has been pointed out (*P.J.* '00, ii. 148) that in reality with 3 parts of Water it forms a stiff paste and only forms a solution when the mixture is gently warmed; but, on cooling, it again forms an almost solid mass of acicular crystals. On adding a little Water to the warm solution the Caffeine separates out as a mass of acicular crystals and not in the form which might be described as a 'white precipitate.'

The more generally occurring impurities are Calcium, Lead, Chlorides, Sulphates, Tartrates, and mineral matter. The presence of Calcium may be detected by Ammonium Oxalate Solution, Lead by Hydrogen Sulphide Solution in a solution made faintly acid with Hydrochloric Acid, Chlorides by Silver Nitrate Solution, Sulphates by Barium Chloride or Nitrate Solution. The *U.S.P.* tests for Tartaric Acid by heating 0·25 gramme of the salt for fifteen minutes on a water-bath with 5 c.c. of concentrated Sulphuric Acid, care being taken to protect the mixture from dust, no brown or black coloration should be developed, but only a lemon-yellow colour. The *B.P.* allows 'a mere trace of ash when heated in air.'

The Belgian Pharmacopœia states that when Caffeine Citrate is prescribed for internal use, the indicated dose should be dispensed as a mixture of equal parts of Caffeine and of Citric Acid.

CAFFEINÆ CITRAS EFFERVESCENS. EFFERVESCENT CAFFEINE CITRATE.

Contains about 2 p.c. of Caffeine (4 p.c. of Caffeine Citrate), or nearly 9 grains of Caffeine in the oz.

Dose.—60 to 120 grains = 4 to 8 grammes.

Foreign Pharmacopœias.—Official in U.S., containing 2 p.c. of Caffeine, and in Span. Not in the others.

For other Caffeine Citrate Effervescing Compounds, *see* PHENACETIN and PHENAZONE.

Not Official.

ELIXIR CAFFEINÆ (*U.S.N.F.*).—Caffeine 17·5, Dilute Hydrobromic Acid (*U.S.P.*) 4, Syrup of Coffee (*N.F.*) 250, Aromatic Elixir (*U.S.P.*) *q.s.* to make 1000. Each fl. drm. contains 1 grain Caffeine.

Dose.—1 to 2 fl. drm. = 3·6 to 7·1 c.c.

CAFFEINÆ HYDROBROMIDUM.—A crystallisable salt, which has been recommended (*P.J.* (3) xxiii. 220) as superior to the *B.P.* Citrate, but as it is instantly decomposed into free Caffeine and Hydrobromic Acid on contact with Water, it has obviously no advantage over the Citrate in this respect.

Solubility.—1 in 52 of Water.

Dose.—1 to 4 grains = 0·06 to 0·26 gramme.

Prescribing Notes.—*It is also prescribed as* **Effervescent Caffeine Hydrobromide,** *containing* 1 *or* 2 *grains of the Hydrobromide in each drm.*

Tests.—When dissolved in Water, neutralised with Potassium or Sodium Hydroxide Solution, and shaken with Chloroform, the chloroformic solution when separated and evaporated to dryness leaves a residue which yields the tests distinctive of Caffeine given under that heading. The neutralised aqueous solution from which the Caffeine has been separated, when slightly acidified with Nitric Acid yields with Silver Nitrate Solution a yellowish curdy precipitate soluble with difficulty in Ammonia Solution, readily soluble in Potassium Cyanide Solution, but insoluble in Nitric Acid. Rendered slightly acid with a few drops of diluted Sulphuric Acid it yields on the addition of Chlorine Water a yellowish-brown coloration, which dissolves to form a reddish-brown solution in Chloroform or Carbon Bisulphide.

Caffeinæ Hydrobromidum Effervescens (*B.P.C.*).—Contains 2 grains of the Hydrobromide in 50 grains of granules.

CAFFEINÆ DI-IODO-HYDRIODIDUM. *Syn.* CAFFEINE TRI-IODIDE.—Prismatic crystals, steel blue by reflected and red by transmitted light, which slowly decompose on the addition of Water. The salt was prepared and introduced by the author at the suggestion of the late Dr. Mortimer Granville, who obtained much success with it in the treatment of gout, the relief afforded being immediate and effective.

Dose.—1 to 3 grains in **pill,** with Glucose and Pulv. Acaciæ.

Tests.—It should contain 42·72 p.c. by weight of loosely-combined Iodine as volumetrically determined by dissolving a suitable quantity (0·5 gramme) in Alcohol (90 p.c.), adding Water to the point of precipitation, and titrating with Deci-normal Volumetric Sodium Thiosulphate Solution. The liquid remaining after titration, after acidification with Nitric Acid, gives with Silver Nitrate Solution a yellow curdy precipitate almost insoluble in Ammonia Solution, insoluble in Nitric Acid, soluble in Potassium Cyanide Solution. With a little Chlorine Water it yields a brown coloration, which dissolves in Carbon Bisulphide with the production of violet-coloured solution; if a little Starch Mucilage be added before the Chlorine Water a blue coloration is produced. The Caffeine obtained on shaking out another portion of this liquid with Chloroform should conform to the distinguishing tests given under that heading.

CAFFEINÆ SODIO-BENZOAS.—A white, amorphous powder, possessing an aromatic odour and bitter and aromatic taste.

Solubility.—1 in 2 of Water, 1 in 30 of Alcohol (90 p.c.).

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

Prescribing Notes.—*It is employed as a soluble salt of Caffeine, but principally by* **hypodermic injection.**

Foreign Pharmacopœias.—Official in Austr. (Coffeinum Natriobenzoicum), 40 p.c. Caffeine; Dan. (Benzoas Natrio-coffeicus), and Jap. (Caffeino-Natrium Benzoicum), 44 p.c. of dry Caffeine; Dutch (Benzoas Natricus cum Coffeino), 45 p.c. of dry Caffeine; Hung. (Coffeinum Natrio-benzoicum), about 75 p.c. Caffeine; Ital. (Benzoato di Sodio e Caffeina), 43 to 46 p.c. of dry Caffeine; Swiss (Coffeino-Natrium Benzoicum), 44 to 46 p.c. of dry Caffeine.

Tests.—Caffeine Sodium Benzoate should contain about 50 p.c. by weight of Caffeine as gravimetrically determined by dissolving a suitable quantity in Water, rendering the solution slightly alkaline with Sodium Hydroxide Solution and shaking out with successive quantities of Chloroform. The residue should yield the tests distinctive of Caffeine described under that substance.

It is official in several Foreign Pharmacopœias, and the proportion of Caffeine varies (*see* Foreign Pharmacopœias). The *U.S.N.F.* requires the salt to contain 50 p.c. of Caffeine.

The aqueous solution from the Chloroform extraction when neutralised with diluted Sulphuric Acid yields with Ferric Chloride Test-solution a buff-coloured precipitate. The Benzoic Acid obtained from the acidified solution should possess the melting point, answer the tests distinctive of Benzoic Acid, and be free from the impurities given under that substance.

CAFFEINÆ SODIO-SALICYLAS.—An amorphous white powder.

Solubility.—1 in 1 of Water; 1 in 28 of Alcohol (90 p.c.).

Ph. Ger. maximum single dose, 1 gramme; maximum daily dose, 3 grammes.

Medicinal Properties.—The same as Caffeine, but being much more soluble is more easily absorbed; it is also suitable for **hypodermic injection.** Has been used in sea-sickness.—*B.M.J.* '87, ii. 768.

Dose.—2 to 15 grains = 0·13 to 1 gramme.

Ph. Ger. maximum single dose, 1 gramme; maximum daily dose, 3 grammes.

Foreign Pharmacopœias.—Official in Belg. (Coffeino-Natricum Salicylicum), Dan. (Salicylas Natrico-coffeicus), Ger. and Jap. (Coffeino-Natrium Salicylicum), 40 p.c. of dry Caffeine; Dutch (Salicylas Natricus cum Coffeino), 45 p.c. of dry Caffeine; Hung. (Coffeinum Natrio-Salicylicum), about 55 p.c. Caffeine; Norw. (Salicylas Natrico-Coffeicus), and Russ. (Coffeinum Natrio-Salicylicum), 40 p.c. Caffeine; Swiss (Coffeino-Natrium Salicylicum), 44 to 46 p.c. of dry Caffeine.

It should be preserved in well-stoppered dark amber-tinted glass bottles.

Tests.—Caffeine Sodium Salicylate should contain about 50 p.c. by weight of pure Caffeine as gravimetrically determined by dissolving a suitable quantity in Water, rendering the solution alkaline by the addition of Potassium or Sodium Hydroxide Solution and extracting the Caffeine by successive shakings with Chloroform. The residue obtained on evaporating the mixed chloroformic solutions, when dried till constant at 100° C. (212° F.) should respond to the tests distinctive of Caffeine given under that substance. The salt is official in several of the Foreign Pharmacopœias, and the percentage of Caffeine required by each individual Pharmacopœia is given above.

The Salicylic Acid obtained on acidifying the aqueous portion remaining after the Chloroform extractions, when washed and dried should possess the melting point, respond to the distinctive tests, and be free from the impurities mentioned under Salicylic Acid.

CAFFEINÆ VALERIANAS.—A variable mixture of Valerianic Acid and Caffeine.

It should be preserved in well-stoppered glass bottles.

Dose.—1 to 3 grains = 0·06 to 0·2 gramme.

Tests.—Caffeine Valerianate should contain theoretically 32·8 p.c. by weight of Valerianic Acid. The Valerianic Acid may be volumetrically determined by titration with Deci-normal Volumetric Potassium or Sodium Hydroxide Solution using Phenolphthalein Solution as an indicator of neutrality. Sufficient neutral Chloroform may be added to form two layers, the Caffeine passes into the chloroformic solution, and the Valerianic Acid, as Potassium or Sodium Valerianate, into the aqueous layer. 1 c.c. of Deci-normal Volumetric Alkali Solution is equivalent to 0·010131 gramme of anhydrous Valerianic Acid.

Commercially the Valerianic Acid varies from 1 p.c. (or less) to 13 p.c., the latter being very exceptional. The majority of commercial specimens are little more than Caffeine scented with Valerianic Acid. The difficulty in forming a true salt is so great that it only exists as a chemical curiosity; but for all purposes of practical dispensing, a product, obtained by absorbing 1 of anhydrous Valerianic Acid by 4 of anhydrous Caffeine, is superior to anything commercially obtainable, and when assayed by the above method shows when freshly prepared about 17 p.c., and even after keeping a considerable time, about 9·7 p.c. of anhydrous Valerianic Acid. The residue obtained on washing and evaporating the chloroformic solution (after titration) to dryness should answer the tests distinctive of Caffeine given under that substance.

ÆTHOXYCAFFEINUM.—A compound of Caffeine, containing an additional Æthoxyl group. Colourless, crystalline needles, less soluble in Water than Caffeine, readily soluble in Alcohol. Heart tonic and diuretic; also narcotic. Given with Sodium Salicylate in migraine and trigeminal neuralgia. Subcutaneously it acts as an anæsthetic. It readily forms soluble double salts with Sodium Benzoate and Salicylate.

Dose.—1 to 3 grains = 0·06 to 0·2 gramme.

The following have also received notice in Medical Literature:—Caffeine-chloral, Caffeine Tri-bromide, Caffeine Sodium Iodide, Caffeine Sulphate, Caffeine Vanadate, Symphoral L. (Lithium Caffeine Sulphonate), Symphoral N. (Sodium Caffeine Sulphonate), and Symphoral Sr (Strontium Caffeine Sulphonate).

CAJUPUTI OLEUM.

OIL OF CAJUPUT.

Fr., Huile Volatile de Cajeput; Ger., Cajeputöl; Ital., Essenza de Cajeput; Span., Esencia de Cayeput.

A transparent green or bluish-green, thin, oily liquid, possessing an agreeable odour resembling Eucalyptus and a pungent, camphoraceous taste.

A volatile Oil distilled from the leaves of *Melaleuca Leucadendron.*

Solubility.—In all proportions of Alcohol (90 p.c.).

Medicinal Properties.—Antispasmodic, carminative and stomachic. Counter-irritant. Given in flatulent colic, hysteria, and other spasmodic and nervous affections. Externally, diluted with Olive Oil (1 to 2), or with Linimentum Terebinthinæ, it is used for chilblains and to allay rheumatic and gouty pains. Applied on lint for toothache.

Dose.—$\frac{1}{2}$ to 3 minims = 0·03 to 0·18 c.c.

Prescribing Notes.—*Given on Sugar, or in Pill or in the form of Spirit of Cajuput. Occasionally as much as 10 minims are given in a mixture.* See *below.*

Official Preparations.—Spiritus Cajuputi; contained in Linimentum Crotonis.

Not Official.—Mistura Cajuputi.

Foreign Pharmacopœias.—Official in Austr., Dutch, Ital., Jap., Norw., Port., Russ., Span., Swed., Swiss and U.S. Not in Belg., Dan., Fr., Ger., Hung. or Mex.

Tests.—Cajuput Oil has a specific gravity of 0·919 to 0·930. The *U.S.P.* gives 0·915 to 0·925 at 25° C. (77° F.). The optical rotation is not given in the *B.P.*; according to the *U.S.P.* it should not exceed $-2°$ in a 100 mm. tube at a temperature of 25° C. (77° F.). Oils are occasionally met with having as high a rotation as $-3° 40'$.

It should contain about 55 to 65 p.c. of Cineol (Eucalyptol) as determined by the Phosphoric Acid process described under Eucalyptus Oil. The *B.P.* makes no attempt to determine the actual amount of Cineol, only requiring that the Oil shall become semi-solid when stirred with one-third or one-half its volume of Phosphoric Acid, specific gravity 1·750, the mixture being kept cool. The *U.S.P.* measures the actual amount of Cineol produced on decomposing the Cineol Phosphate. A measured quantity of 10 c.c. of the oil is dissolved in 5 times its volume of purified Petroleum Benzin, cooled by a freezing mixture; Phosphoric Acid, specific gravity 1·707, cautiously added until the white crystalline magma commences to assume a yellowish or pinkish tint. The crystals are filtered under pressure, washed with cold purified Petroleum Benzin and dried by pressure between porous plates. The crystals are decomposed by warm Water and the volume of Cineol read off in a narrow graduated cylinder; the oil should yield not less than 55 p.c.

The green colour of the oil is generally supposed to be due to Copper, which may be detected by shaking the oil with an equal volume of Water containing a drop or two of diluted Hydrochloric Acid. The oil loses its green colour and the aqueous portion when tested with a drop or two or Potassium Ferrocyanide Solution, yields a reddish-brown colour if Copper be present. The *U.S.P.* includes a test for absence of Copper, which is given below in small type under the heading of Potassium Ferrocyanide.

Potassium Ferrocyanide.—On shaking 5 c.c. of the Oil with 5 c.c. of Water containing 1 drop of diluted Hydrochloric Acid, a reddish-brown colour should not be produced in the acid liquid when separated from the Oil, if a drop of Potassium Ferrocyanide Test Solution be added (absence of Copper).

Preparation.

SPIRITUS CAJUPUTI. Spirit of Cajuput.

Oil of Cajuput, 1; Alcohol (90 p.c.), *q.s.* to yield 10.

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

Not Official.

MISTURA CAJUPUTI.—Oil of Cajuput, 80 minims; Compound Spirit of Orange (*U.S.P.*), 80 minims; Powdered Tragacanth, 8 grains; powdered Gum Acacia, 120 grains; Glycerin, 1 fl. oz.; Chloroform Water, to 8 oz.

Dose.—1 to 4 fl. drm. = 3·6 to 14·2 c.c.

Not Official.

CALAMINA PRÆPARATA.

PREPARED CALAMINE.

Native Zinc Carbonate, calcined in a covered earthenware crucible at a moderate temperature, powdered and freed from gritty particles by elutriation. Genuine Calamine has a yellowish-grey colour; the reddish varieties are generally made on a basis of Barium Sulphate.

Medicinal Properties.—Mildly astringent, used in face lotions and dusting powders.

Calamina Artificiosa.—Dissolve 861 parts of Crystallised Sulphate of Zinc in Water, and add 15 fluid parts of Strong Solution of Perchloride of

Iron (*B.P.*). Next dissolve 890 parts of Crystallised Sodium Carbonate in a separate quantity of Water, mix the solutions. Shake well, collect the precipitate on a calico filter. Wash until free from Sulphate, well drain, heat in a lightly covered crucible until a portion of it ceases to effervesce on the addition of an acid. Cool and grind to an impalpable powder.—*Y.B.P.* 1893, 210; *P.J.* '93, i. 622; *C.D.* '93, i. 73.

Calamina Factitia (*B.P.C.*) uses the above process, with quantities as follows:—Zinc Sulphate, 56; Sodium Carbonate, 58; Strong Solution of Ferric Chloride, 1; Distilled Water, *q.s.*

LINIMENTUM CALAMINÆ.—Prepared Calamine, 20 grains; Zinc Oxide, 15 grains; Solution of Lime, 2 drm.; Water, 2 drm.; Olive Oil, to 1 fl. oz. —*Guy's.*

Variations of this are given in Great Northern, Middlesex and University Hospital Pharmacopœias. The following is sometimes prescribed, but unless treated in the manner here described it is difficult to dispense:—Calamine, 3 drm.; Zinc Oxide, 2 drm.; Lime Water, 4 fl. oz.; Olive Oil, 4 fl. oz.

Rub the powders with the Lime Water in a mortar to a smooth cream, and then add the whole of the Oil at once and stir together.

This has been incorporated in the *B.P.C.*

Prepared Calamine, 4·50; Zinc Oxide, 3·50; Solution of Lime, 50; Olive Oil, *q.s.* to produce 100.—*B.P.C.*

LOTIO ZINCI OXIDI.—Zinc Oxide, 60 grains; Prepared Calamine, 60 grains; Glycerin, 60 minims; Water, 1 fl. oz.

A mild astringent in chronic eczema and acne rosacea.

Most of the Hospital Pharmacopœias give a formula under the heading Lotio Calaminæ or Lotio Zinci Oxidi.

LOTIO CALAMINÆ.—Levigated Calamine, 40 grains; Zinc Oxide, 20 grains; Glycerin, 20 minims; Water (or Rose Water), *q.s.* to make 1 fl. oz. Elutriate the Calamine and Zinc Oxide by triturating with the Water and decanting from the siliceous matter, then add the Glycerin.—*Canadian Formulary* first issue).

This has been incorporated by the *B.P.C.* as follows:—

Prepared Calamine, 10; Zinc Oxide, 5; Glycerin, 5; Rose Water, *q.s.* to produce 100.

Lotio Calaminæ.—Levigated Calamine, 40 grains; Zinc Oxide, 20 grains; Glycerin, 20 minims; Lime Water, *q.s.* to make 1 fl. oz.—*Canadian Formulary* 1908.

UNGUENTUM CALAMINÆ.—Prepared Calamine, 1; Benzoated Lard, 5.—*B.P.* 1885.

This has been incorporated in the *B.P.C.*

CERATUM CALAMINÆ (*Ph. Lond.*).—Calamine, 7½; Beeswax, 7½; Olive Oil, 20.

This has been incorporated in the *B.P.C.* as follows:—

Ceratum Calaminæ.—Prepared Calamine, 2; Yellow Beeswax, 2; Olive Oil, 6.

Ph. Edin.—Calamine, 1; Simple Cerate, 5; commonly known as *Turner's Cerate.*

CALCII CARBONAS PRÆCIPITATUS.

PRECIPITATED CALCIUM CARBONATE.

B.P.Syn.—Precipitated Chalk.

Fr., Carbonato de Chaux Précipité; Ger., Calciumcarbonat;
Ital., Carbonato di Calcio; Span., Carbonato de Cal.

$CaCO_3$, eq. 99·26.

A white, inodorous, tasteless powder.

It may be obtained by precipitating a soluble Calcium salt, usually the Chloride with Sodium Carbonate.

Solubility. Insoluble in Water and Alcohol. Soluble with effervescence in dilute mineral Acids and some of the organic Acids.

Medicinal Properties.—Antacid, astringent and desiccant. Used in dyspepsia with acidity; valuable in diarrhœa; as a dusting powder in eczema, and for burns.

Dose.—10 to 60 grains = 0·65 to 4 grammes.

Official Preparation.—Used in the preparation of Trochiscus Bismuthi Compositus.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—Precipitated Chalk effervesces upon the addition of acids, yielding a colourless and odourless gas, which affords, when passed into Lime Water or into Barium Hydroxide Solution, a white precipitate.

When dissolved in just sufficient Hydrochloric Acid to effect solution, boiled and cooled, it answers the tests distinctive of Calcium, which are that, when mixed with sufficient Ammonia Solution to render the solution faintly alkaline, Ammonium Oxalate Solution produces a white precipitate, soluble in Hydrochloric Acid, insoluble in Acetic Acid; Ammonium Carbonate Solution produces a white precipitate which, after well boiling, is insoluble in Ammonium Chloride Solution.

The *U.S.P.* states that the salt should contain not less than 99 p.c. of pure Calcium Carbonate, but no process is given for the determination. The *B.P.* and *P.G.* neither state the requisite percentage nor method of determination. It is usually determined gravimetrically as Oxalate, the Calcium Oxalate being ignited and weighed as Calcium Oxide.

The more generally occurring impurities are Aluminium, Iron, Magnesium, Chlorides, Phosphates and Sulphates. Aluminium, Iron and Phosphates, if present, may be detected by Ammonia Solution in presence of Ammonium Chloride. The *P.G.* gives a specific test for Iron with Potassium Ferrocyanide Solution, which is described in small type below. The *U.S.P.* includes a test for heavy metals. The standard suggested (*C.D.* '08, i. 796) for Lead is 10 parts per 1,000,000, and for Arsenic 5 parts per 1,000,000. Both *P.G.* and *U.S.P.* fix a limit of soluble impurities, ascertained by evaporating an aqueous extract. Chlorides and Sulphates are indicated by Silver Nitrate and Barium Chloride or Nitrate Solutions respectively.

Ammonia.—If to 20 c.c. of the Hydrochloric Acid solution, Ammonia Water be added until of alkaline reaction, no turbidity or precipitation should take place, either before or after boiling, indicating the limit of Iron, Aluminium, Phosphates, etc., *U.S.P.* A solution of the salt in Acetic Acid should not give a precipitate on saturation with Solution of Ammonia, *P.G.*

Barium Nitrate.—The 1–50 solution obtained on boiling, by means of diluted Acetic Acid should not be at once affected by Barium Nitrate Solution, *P.G.*

Silver Nitrate.—The 1-50 aqueous solution obtained by dissolving in diluted Acetic Acid and boiling shall at the most be rendered only faintly opalescent after five minutes on the addition of Silver Nitrate Solution, *P.G.*

Potassium Ferrocyanide.—The solution obtained by dissolving 1 gramme of the salt by the aid of Hydrochloric Acid in 50 c.c. of Water shall not become blue on the addition of 0·5 c.c. of Potassium Ferrocyanide Solution, *P.G.*

CRETA PRÆPARATA. *See* p. 456.

CALCII CHLORIDUM.

CALCIUM CHLORIDE.

$CaCl_2\ 2H_2O$, eq. 145·85.

FR., CHLORURE DE CALCIUM; GER., CALCIUMCHLORID.

White, or nearly white, slightly translucent, hard fragments, having a sharp saline taste. Very deliquescent.

The official salt is obtained by the interaction of Hydrochloric Acid and Calcium Carbonate, the latter being added until the Acid is neutralised. The salt is dried at a temperature not exceeding 200° C. (392° F.). A slight dissociation and loss of Hydrochloric Acid occurs during the drying, and most commercial samples are alkaline.

The *U.S.P.* gives no specific temperature at which the salt should be dried, but states that when it has been overheated the solution has an alkaline reaction and a residue of Oxide remains undissolved; which, however, goes into solution in Hydrochloric Acid.

It should be kept in glass bottles with closely-fitting glass stoppers.

Solubility.—1 in 1 of Water; 1 in 3 of Alcohol (90 p.c.).

Medicinal Properties.—It increases the coagulability of the blood, and is therefore used in gastric, intestinal and pulmonary hæmorrhage, also in hæmophilia and aneurisms. Has been given internally also for chilblains, 20 grains night and morning, and in glandular enlargements, especially those of tubercular origin.

Given in pneumonia.—*Pr.* l. 263; liii. 343.

10 to 20 grains every 4 hours given in hæmophilia.—*L.* '97, ii. 1061; *L.* '98, ii. 144; *B.M.J.* '02, i. 1141; *P.J.* '03, i. 525.

A small pledget of Wool soaked in a solution containing 30 grains to the oz. of Water, used successfully in hæmophilia.—*L.* '03, i. 517.

If pulmonary hæmorrhage persists, 2 or 3 drm. Chloride or Lactate of Calcium should be given in the course of a few hours.—*T.G.* '07, 323.

In pneumonia, 5 to 10 grains dissolved in Water every 4 hours; 1 minim of Elixir of Saccharin covers the taste of 10 grains; does not interfere with use of other remedies (Lauder Brunton).—*B.M.J.* '07, i. 616.

Valuable in hæmorrhagic type of pneumonia, but its use deprecated in dry.—*B.M.J.* '07, i. 1176.

Can have no place in treatment of early stage of pneumonia (William Ewart).—*B.M.J.* '07, i. 779.

In hæmorrhagic gastric oozing, 10 grains thrice daily (Hale White).—*L.* '06, ii. 1193.

Rapidly effective, in 3 or 4 grain doses thrice daily, in purpura in children (*B.M.J.* '07. i. 199), and in 15 grain doses in boy of 16, p. 1365.

Given as a preventive in full doses for 3 days before any intranasal operation; and as a curative in 20 to 60 grain doses in hæmorrhage after extraction of teeth.—*B.M.J.* '07, i. 1054; ii. 83.

When used for hæmoptysis it must not be given for more than 3 or 4 days at a time, otherwise the blood will become less coagulable.—*Pr.* '07, i. 335.

It markedly diminished the amount of albumen excreted by patients with Bright's disease of the non-polyuric form, but who passed 3 to 15 grammes albumen per litre.—*L.* '07, i. 841.

The value of this salt in intestinal hæmorrhage, given in 10 or 20 grain doses every 3 hours has been shown (*B.M.J.* '04, 1453); 30 to 40 grains, dissolved in a little Water and injected into the rectum, has also been recommended (*B.M.J.* '04, ii. 1635); objection has been taken to this method on account of disturbing patient (*B.M.J.* '04, i. 1783), but it has been pointed out (*B.M.J.* '05, i. 103) that good results in hæmoptysis have been accompanied by very little discomfort to patient.

It is stated (*B.M.J.* '06, i. 26) that this substance acts as a harmless and simple preventive against free bleeding when administered prior to an operation, and at the same time is not less efficient than other hæmostatic agents. Administered in 1 drm. doses night and morning for 3 days previous to operation to prevent hæmorrhage in excision of the testicle in a case of tubercular disease of the seminal tract.—*M.P.* '06, ii. 38.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Prescribing Notes.—*This Salt has a very unpleasant taste which is difficult to cover. Elixir Calcii Chloridi accomplishes this better than Liquorice.*

Incompatibles.—Lime salts and Potassium salts are mutually antagonistic physiologically.—*B.M.J.* '87, ii. 1033.

Official Preparations.—Used in the preparation of Æther Purus.

Not Official.—Elixir Calcii Chloridi, Liquor Calcii Chloridi, Syrupus Calcii Chloridi.

Foreign Pharmacopœias.—Official in U.S.; Hung. (Calcium Chloratum Fusum), Port. (Chloreto de Calcio), Fr. (Chlorure de Calcium Cristallisé and Chlorure de Calcium Fondu), Mex. (Cloruro de Calcio), Span. (Cloruro Calcico). Not in the others.

Tests.—Calcium Chloride should answer the tests distinctive of Calcium given in the large type under Calcii Carbonas Præcipitatus. The aqueous solution yields with Silver Nitrate Solution a white curdy precipitate, insoluble in Nitric Acid, soluble in Ammonia Solution and in Potassium Cyanide Solution. A small quantity of the salt heated with Manganese Dioxide and Sulphuric Acid evolves a yellowish-green gas recognised as Chlorine by its odour and liberating Iodine from Potassium Iodide Solution, which on the addition of Starch Mucilage yields a blue coloration.

The *B.P.* does not fix a limit for the amount of pure Calcium Chloride which the salt shall contain, the *U.S.P.* requires that it shall contain not less than 99 p.c. of the pure salt. Neither Pharmacopœia describes a process of determination. The neutral aqueous solution may be titrated with Deci-normal Volumetric Silver Nitrate Solution, or the Calcium may be determined as Oxalate, the Oxalate washed, dried, ignited, and weighed as Calcium Oxide.

The more generally occurring impurities are Aluminium, Iron, Magnesium, Carbonates and Hypochlorite. Aluminium, Iron and Magnesium, if present, may be detected by the Ammonia Solution test given below in small type under the heading of Ammonia;

Carbonates by an effervescence following the addition of Hydrochloric Acid. Magnesium by Ammonium Phosphate Solution after separation of the Calcium as Oxalate in presence of Ammonium Chloride and a trace of Ammonia Solution. Hypochlorite might have been a likely impurity in a salt made according to the process described in *B.P.* '85; but its presence in a sample prepared according to the *B.P.* '98 directions is unlikely, especially when dried at the temperature officially directed. The *U.S.P.* includes Phosphates as capable of detection by Ammonia Solution test; it also includes a time-limit test for Arsenic and Lead, with Hydrogen Sulphide and a test indicating a limit of Magnesium and alkalis, it is performed by completely precipitating the Calcium from 10 c.c. of a 1 in 20 aqueous solution by means of Ammonium Oxalate Test-solution, evaporating the filtrate to dryness and igniting; not more than 0·1 of a gramme of fixed residue should remain. The salt is not official in *P.G.*

Ammonia.—If to the aqueous solution of the salt Ammonia Water be added until of alkaline reaction, no turbidity or precipitation should take place, either before or after boiling, *U.S.P.*

Hydrogen Sulphide.—The aqueous solution of the salt (1–20) slightly acidulated with Hydrochloric Acid should not respond to the time-limit test for Arsenic or Lead, *U.S.P.*

Not Official.

LIQUOR CALCII CHLORIDI.—Chloride of Calcium 1, Distilled Water 5. —*B.P.* 1885.

This has been incorporated in the *B.P.C.* as follows:—

Calcium Chloride 16; Distilled Water, *q.s.* to produce 100.

ELIXIR CALCII CHLORIDI.—Chloride of Calcium, 60 grains; Citric Acid, 20 grains; Aromatic Elixir (*U.S.P.*), to 1 fl. oz.

Syrupus Calcii Chloridi. *Syn.* Elixir of Calcium Chloride.—Calcium Chloride 12·50, Citric Acid 5, Distilled Water 15, Aromatic Syrup, *q.s.* to produce 100.—*B.P.C.*

CALX CHLORINATA. *See* p. 298.

Not Official.

CALCII GLYCEROPHOSPHAS.

CALCIUM GLYCEROPHOSPHATE.

Fr., Glycérophosphate de Calcium; Ger., Glycerinphosphorsaures Calcium; Ital., Glicerofosfato di Calcio; Span., Glicerofosfato de Cal.

A white, odourless, crystalline powder.

It is prepared by the action of Milk of Lime on Glycerophosphoric Acid, the product being purified by treatment with Alcohol.

Solubility.—1 in 22 of Water, less soluble in warm Water, and almost insoluble in boiling Water; insoluble in Alcohol (90 p.c.).

Medicinal Properties.—It improves the general nutrition in neurasthenia.

Dose.—5 to 15 grains = 0·32 to 1 gramme dissolved in Water.

Prescribing Notes.—*Liquid Glycerophosphate preparations keep best when undiluted, and any dilution should be done when the medicine is taken; but if* *prescribed in a diluted form the diluent should be Chloroform Water, not Distilled Water.*

Foreign Pharmacopœias.—Official in Belg., Fr., Mex. (Glicerofosfato de Calcio), Span. (Glicerofosfato de Cal), and Swiss (Calcium Glycerinophosphoricum).

Tests.—Calcium Glycerophosphate dissolves in Water, yielding a solution which is neutral in reaction towards Litmus paper. The aqueous solution yields with Ammonium Oxalate a white precipitate soluble in diluted Hydrochloric Acid; when the cold aqueous solution is warmed a white precipitate is thrown out, the salt being less soluble in warm than in cold Water. A little of the salt heated in a tube blackens and evolves the characteristic irritating odour of Acroleine; when ignited on platinum foil it burns with a luminous flame, leaving a white residue, which dissolved in Nitric Acid yields a solution giving on the addition of Ammonium Molybdate Solution a yellow precipitate insoluble in Nitric Acid, soluble in Ammonia Solution.

The Glycerophosphates do not answer the usual reactions of the Phosphates, that is to say they do not give an immediate precipitate with Ammonium Molybdate Solution, nor do they immediately precipitate with Magnesium Ammonio-sulphate Solution. On boiling with a mineral acid the Glycerophosphoric Acid is decomposed, and the solution then responds to the tests for Phosphoric Acid. The aqueous solution of the salt yields a white precipitate with Lead Subacetate Solution. The percentage of Phosphoric Acid may be determined volumetrically by titration of the aqueous solution with Deci-normal Volumetric Sulphuric or Hydrochloric Acid Solution, using Methyl Orange Solution as an indicator, and then titrating the solution with Deci-normal Volumetric Potassium or Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator. In the first instance one molecule of mineral acid corresponds to two molecules of Phosphoric Acid, and in the second two molecules of alkali correspond to one molecule of Phosphoric Anhydride.

The more generally occurring impurities are Arsenic, heavy metals, *e.g.*, Lead, Copper, and Iron; Chlorides, Phosphates, and Sulphates; readily carbonisable organic impurities, and free Glycerin.

Arsenic, if present, may be detected by Bettendorf's test; heavy metals by Hydrogen Sulphide in a solution rendered faintly acid with Hydrochloric Acid; Iron by Ammonium Hydrosulphide Solution; Chlorides by Silver Nitrate Solution in a solution rendered acid with Nitric Acid; Phosphates and Sulphates generally exist as insoluble salts and are readily detected by the solubility, and also by Barium Chloride or Nitrate Solution; organic impurities by charring when the salt is treated with concentrated Sulphuric Acid; and free Glycerin by treating the dry salt with Absolute Alcohol, filtering and evaporating off the solvent.

GLYCEROL GLYCEROPHOSPHATIS.—Cudbear, 15 grains; Distilled Water, 10 fl. oz. Boil for 10 minutes, filter and dissolve in the warm filtrate, Calcium Glycerophosphate, 160 grains; Potassium Glycerophosphate, 80 grains; Sodium Glycerophosphate, 80 grains; Magnesium Glycerophosphate, 80 grains; Iron Glycerophosphate (in scales), 40 grains; Citric Acid, 30 grains; then add Glycerin, 10 fl. oz.; Chloroform, 5 minims; Alcohol, 40 minims; Orange Flower Water (triple), 2 fl. drm.; Cherry Laurel Water, 3 fl. drm.; Distilled Water, *q.s.* to produce 20 fl. oz.—*Bournemouth Formulary.*

This has been incorporated in the *B.P.C.* under the title **Glycerinum Glycerophosphatum Compositum.** *Syn.* Glycerol Glycerophosphatis.

SYRUPUS GLYCEROPHOSPHATUM.—The following is the formula given by Dr. Robin, who introduced the preparation:—Calcium Glycerophosphate, 6 grammes; Sodium, Potassium, and Magnesium Glycerophosphates, of each 2 grammes; Iron Glycerophosphate, 1 gramme; Tinctura Ignatia Amara, 30 minims; Pepsin, 3 grammes; Maltine, 1 gramme; Tincture of Kola, 10 grammes; Syrup of Cherries, to 200 grammes.—*P.J.* '95, i. 1191.

Nearly all commercial Syrups of the Glycerophosphates become turbid and throw down a bulky deposit on standing, and the same objection applies to **Syrupus Glycerophosphatum Compositus** (*B.P.C.*). The composition of this latter preparation has been altered twice in about twelve months. It first of all contained Citric Acid, which was replaced by Acetic Acid, which is now replaced in the *B.P.C. Supplement* by Glycerophosphoric Acid.

FERRI GLYCEROPHOSPHAS (Iron Glycerophosphate). — Yellow or yellowish-green scales, or as a white powder, soluble in cold Water, more readily in hot. Introduced as a nervine tonic. Has been recommended in anæmia and especially chlorosis.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Acidum Glycerophosphoricum.—A clear, colourless, or pale yellowish-syrupy liquid. Sp. gr. 1·127. Chiefly used for the preparation of the salts, but rarely used medicinally.

CALCII HYDRAS.

CALCIUM HYDROXIDE.

B.P.Syn.—SLAKED LIME.

$Ca(HO)_2$, eq. 73·47.

A white odourless powder, having a caustic taste.

The Pharmacopœia directs that 'it should be recently prepared,' but this is unnecessary if air be excluded.

It should be kept in well-stoppered glass bottles, and protected as far as possible from contact with the air.

Solubility.—Sparingly soluble in Water (1 in 900); the solution, on exposure to the air, soon acquires a film of Calcium Carbonate.

Medicinal Properties.—Antacid, astringent, sedative. The **Solution** (Lime Water) is useful in acid and gouty dyspepsia; in vomiting and diarrhœa of children, especially if given with the Milk, as it renders the curd less dense; in enteric fever it lessens the chances of hæmorrhage; also in the form of diluted **saccharated solution** to relieve chronic vomiting, and vomiting of pregnancy. The **Liniment** of Lime is applied to burns and scalds. When made with Linseed Oil it is known as Carron Oil.

Incompatibles.—Vegetable and Mineral Acids, alkaline and metallic salts, Tartar Emetic.

Official Preparations.—Liquor Calcis and Liquor Calcis Saccharatus. Used in the preparation of Calcii Hypophosphis, Chloroformum, Extractum Ipecacuanhæ Liquidum. **Lime Water** is used in the preparation of Argenti Oxidum, Linimentum Calcis, Lotio Hydrargyri Flava and Lotio Hydrargyri Nigra.

Not Official.—Liniment for freckles, Carron Oil.

Foreign Pharmacopœias.—Official in Fr. (Hydroxide de Calcium) and Span. (Cal Apagada). Not in the others.

Tests.—Slaked Lime when dissolved in Water or in diluted Hydrochloric Acid and neutralised should afford the tests distinctive of Calcium given in the large type under Precipitated Calcium Carbonate. The aqueous solution should be alkaline in reaction to red Litmus paper and to Phenolphthalein Solution, and may be titrated with Normal Volumetric Hydrochloric or Sulphuric Acid Solution by the use of the latter indicator. 1 c.c. of Normal Volumetric Acid Solution is equal to 0·036735 gramme of pure Calcium Hydroxide. When strongly heated the salt loses nearly one-fourth of its weight of Water.

The more generally occurring impurities are Aluminium, Iron, Magnesium, Potassium, Sodium; Carbonates, Chlorides, Phosphates and Sulphates; and Silica if present is detected by the residue remaining insoluble in diluted Hydrochloric Acid, especially if, after first dissolving in Hydrochloric Acid the solution is evaporated to dryness and redissolved in Hydrochloric Acid; Aluminium, Iron and Phosphates are shown by the appearance of a precipitate when the Hydrochloric Acid Solution is rendered distinctly alkaline with Ammonia Solution; Magnesium by the precipitate produced with Ammonium Phosphate after separation of the Calcium as Oxalate in a solution containing Ammonium Chloride and a slight excess of Ammonia Solution. Potassium and Sodium may be detected, if present, in the residue after complete separation of the Calcium by Ammonium Oxalate. The absence of effervescence on the addition of Hydrochloric Acid is indicative of the absence of Carbonate, whilst Chloride may be detected in the Nitric Acid Solution of the salt by Silver Nitrate Solution and Sulphates in another portion of the same solution by means of Barium Chloride or Nitrate Solution. Phosphate may be detected by adding Ammonium Molybdate Solution to a solution of the salt containing some free Nitric Acid.

Preparations.

LINIMENTUM CALCIS. Liniment of Lime.

Solution of Lime, 1; Olive Oil, 1. (1 in 2)

Foreign Pharmacopœias.—Official in Belg., Solution of Lime and Medicinal Oil, equal parts; Fr. (Linim. Calcaire), Solution of Lime and Olive Oil, equal parts; Ital., Lime Water and Olive Oil, equal parts; Jap. and Mex., Lime Water 1, Sesame Oil 1; Port., Lime Water 9, Oil of Almonds 1; Span., (Linimento Oleo-Calcareo) Lime Water 65, Oil of Almonds 35; Austr., Dan. (Linimentum Calcicum), Dutch, Russ., Swed., Swiss and U.S., Solution of Lime and Linseed Oil, equal parts. All by weight, except U.S. Not in the others.

LIQUOR CALCIS. Solution of Lime. *B.P.Syn.*—Lime Water.

A saturated Solution of Calcium Hydroxide (washed free of Chlorides) in Distilled Water. It should contain about $\frac{1}{2}$ grain in the fl. oz.

It should be kept in well-stoppered glass bottles of a dark amber colour, and preserved as far as possible from contact with the air. It is best kept in full bottles.

When freshly prepared it forms a colourless and odourless liquid possessing a peculiar alkaline taste. It gradually absorbs Carbonic Anhydride from the air, and a crust of Calcium Carbonate forms on the surface of the liquid.

The Hydrate is less soluble in hot than in cold Water, and, if saturated, Lime Water should precipitate on boiling.

Dose.—1 to 4 fl. oz. = 28·4 to 113·6 c.c.

It is more palatable when given in Milk.

So-called aerated 'Lime Water' is sold in syphons, but we understand that it is aerated with Carbonic Acid gas, and in that case the name is misleading.

Foreign Pharmacopœias.—Official in Austr. and Hung. (Aqua Calcis); Dan., Dutch, Norw. and Swed. (Solutio Hydratis Calcici); Fr. (Eau de Chaux); Ger. and Jap. (Aqua Calcariæ); Ital. (Acqua di Calce); Mex., Port. and Span. (Agua de Cal); Russ. (Calcaria Caustica Soluta); Belg., Swiss (Calcium Hydricum Solutum); U.S., Liquor Calcis.

Water becomes saturated with much less Lime than ordered in any of the Pharmacopœias, therefore Liquor Calcis is of the same strength in all.

Tests.—Lime Water is strongly alkaline in reaction towards Litmus. It should yield the tests distinctive of Calcium described in the large type under Calcium Carbonate. It is officially required to contain 0·153 p.c. w/v of pure Calcium Hydroxide, as volumetrically determined by titration with Deci-normal Volumetric Sulphuric Acid Solution. Neither the *B.P.* nor the *P.G.* specify a particular indicator; the *U.S.P.* mentions Phenolphthalein Solution. The *P.G.* requires not less than 0·148 p.c. w/v, nor more than 0·166 p.c. w/v, the *U.S.P.* not less than 0·14 p.c. w/v, of pure Calcium Hydroxide.

The liquor should be free from the more generally occurring impurities mentioned under Calcium Hydrate, and in addition should be free from objectionable traces of Lead.

LIQUOR CALCIS SACCHARATUS. SACCHARATED SOLUTION OF LIME.

Calcium Hydroxide, 1; Refined Sugar, in powder, 2; Distilled Water, 20. (about 1 in 62)

Contains about 8 grains of CaO in 1 fl. oz. 1 oz. = about 14 fl. oz. Lime Water.

As suggested in our former editions the Sugar should be first dissolved in the Water, and the Calcium Hydroxide added to the Solution; after a few hours' occasional agitation, decant.

It should be kept in well-stoppered glass bottles of a dark amber colour, which should be kept full, and preserved as far as possible from contact with the air.

The Hydrate in this case also is less soluble in the hot than in the cold, and the liquor precipitates on boiling, but clears again on cooling.

A clear, colourless, and odourless liquid possessing a peculiar sweetish and alkaline taste.

Dose.—20 to 60 minims = 1·2 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Hung. (Aqua Calcis Saccharata). Not in the others.

Tests.—Saccharated Solution of Lime has a specific gravity of about 1·055, and is officially required to indicate 2·31 p.c. w/w of pure Calcium Hydroxide, as volumetrically determined by titration with Normal Volumetric Sulphuric Acid Solution. In this case also the *B.P.* specifies no indicator of neutrality. Phenolphthalein Solution is best for the purpose.

The liquor should be free from the impurities usually associated with the Hydroxide from which it is prepared, and in addition should not contain objectionable traces of Lead.

Not Official.

LINIMENT FOR FRECKLES.—Liniment of Lime, 8; Solution of Ammonia, 1; mix.

CARRON OIL.—Equal parts of Linseed Oil and Lime Water, shaken to form a cream.

One of the best **applications** to burns or scalds, more particularly when 1 or 2 p.c. of Phenol has been added.

This has been incorporated in the *B.P.C.* under the title **Linimentum Calcis cum Oleo Lini.**

CALCII HYPOPHOSPHIS.

CALCIUM HYPOPHOSPHITE.

FR., HYPOPHOSPHITE DE CALCIUM; GER., CALCIUM HYPOPHOSPHOROSUM; ITAL., IPOFOSFITO DI CALCIO; SPAN., HIPOFOSFITO CALCICO.

$Ca(PH_2O_2)_2$, eq. 168·83.

A white, odourless, lustrous crystalline salt, or as a white crystalline powder, having a nauseous bitter taste.

It should be kept in well-stoppered bottles and in a cool place. The salt readily undergoes oxidation, and on this account great care should be exercised in mixing it with substances which readily part with Oxygen, *e.g.*, Chlorates, Nitrates, and Peroxides.

It may be obtained by the combined action of Calcium Hydroxide, Phosphorus, and Water, the salt being purified by recrystallisation.

Solubility.—1 in 8 of Water, and scarcely more soluble in boiling Water. Insoluble in Alcohol (90 p.c.).

Medicinal Properties.—Similar to those of Phosphorus, but without its unpleasant effects. Given in cases of nervous and general debility; it is by some supposed to be useful in phthisis.

No satisfactory evidence that Hypophosphites can influence nutrition in any way differently from other indifferent salts, and the whole of the Hypophosphite administered can be recovered unchanged from the urine.—*B.M.J.* '06, ii. 1460.

Dose.—3 to 10 grains = 0·2 to 0·65 gramme.

Prescribing Notes.—*Usually given in mixtures or in one of the various forms of Syrup.*

Not Official.—Glycerola Hypophosphitum, Syrupus Hypophosphitum, Syrupus Calcii Hypophosphitis (*Squire*) and Syrupus Calcii et Sodii Hypophosphitum.

Foreign Pharmacopœias.—Official in Belg., Jap. and Swiss (Calcium Hypophosphorosum), Dutch and Norw. (Hypophosphis Calcicus), Fr. (Hypophosphite de Chaux), Ital. (Ipofosfito di Calcio), Mex. (Hipofosfito de Calcio), Port. (Hypophosphito de Cal), Span. (Hipofosfito Calcico), U.S. Not in the others.

Tests.—The distinguishing tests for Calcium Hypophosphite are:

(1) that when heated to redness the crystals evolve spontaneously inflammable Hydrogen Phosphide and Hydrogen, and leave a reddish-coloured residue; (2) an aqueous solution rapidly reduces Potassium Permanganate Solution, yielding if the proportionate quantity of Permanganate be employed a practically colourless filtrate; (3) the aqueous solution reduces Mercuric Chloride Solution first to Mercurous Chloride and ultimately more completely to metallic Mercury. Upon its property of reducing Potassium Permanganate Solution is founded the official quantitative test of its purity, which requires that when 0·25 gramme of the salt is boiled for 10 minutes with 0·6 gramme of Potassium Permanganate in solution, and the liquid filtered, the filtrate shall be practically colourless. Several methods have been proposed with a view to affording a more accurate quantitative determination. Tyrer has suggested (*P.J.* '97, ii. 150) reduction of Copper Solution, previously eliminating any impurity likely to affect the result, by treatment with Barium Chloride Solution. Jowett points out (*Y.B.P.* '98, 412; *C.D.* '98, ii. 300) that Barium Phosphite is slightly soluble in Water, which would affect the results obtained, and proposes the following method:—About 0·3 gramme of the dried salt is dissolved in 10 c.c. of Water, 3 c.c. of a 10 p.c. Lead Acetate solution added, and the mixture allowed to stand 12 hours. It is then filtered, the precipitate thoroughly washed, and the washings added to the filtrate, which is acidified with Hydrochloric Acid, and then saturated with Hydrogen Sulphide, boiled, filtered, and the Lead Sulphide thoroughly washed. The mixed washings and filtrate are then evaporated to a low bulk and 5 c.c. Hydrochloric Acid and 1 gramme Potassium Chlorate added, and gently heated for half an hour, then concentrated to about 20 c.c., and the Phosphate finally determined either gravimetrically or volumetrically by the usual methods. The *U.S.P.*, although requiring that it shall contain not less than 98 p.c. of pure Calcium Hypophosphite, gives no process for its determination. The salt is not official in the *P.G.*

The more generally occurring impurities are Aluminium, Arsenic, Copper, Iron, Lead, Magnesium, Potassium, Sodium, Chlorides or Sulphates, Phosphates or Phosphites. The *B.P.* groups these collectively. A 1 in 20 aqueous solution of the salt acidified with Hydrochloric Acid should yield no turbidity or darkening in colour on the addition of Hydrogen Sulphide, indicating the absence of Arsenic, Copper and Lead, nor on the subsequent addition of Ammonia Solution should any appreciable darkening in colour ensue, indicating the absence of more than a trace of Iron. The 1 in 20 aqueous solution, after the complete precipitation of the Calcium as Oxalate, should afford no turbidity on the addition of Sodium Phosphate Solution, indicating the absence of Magnesium. The *U.S.P.* does not include tests for Aluminium, Magnesium, Potassium, Sodium or Phosphites; the modified Gutzeit's test is employed in testing for Arsenic, and the time-limit test for heavy metals. The *B.P.* employs Lead Acetate Solution to detect Phosphates and Phosphites, but no commercial sample has been found which does not give more or less precipitate or turbidity with Lead Acetate, which also precipitates Sulphates and Sulphites.

The *U.S.P.* takes the solubility of the salt in Water as a criterion of the absence of Phosphate and Sulphate.

Modified Gutzeit's Test.—If 5 c.c. of an aqueous solution of the salt (1–10) be measured into a beaker containing 3 c.c. of Nitric Acid diluted with about 10 c.c. of Water and evaporated to dryness on a water-bath the residue should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Time-limit Test.—A (1–20) aqueous solution of the salt acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Not Official.

GLYCEROLA HYPOPHOSPHITUM (*Squire*).—Calcium, Potassium, and Sodium Hypophosphites, of each 1; dissolve these in Water, 40; filter and add Sugar, 40; Orange-flower Water, 2; Cherry-laurel Water, 2; dissolve and add Glycerin, 12, and filter.

Dose.—1 to 2 fl. drm. = 3·6 to 7·1 c.c.

Glycerol Hypophosphitis.—Hypophosphite of Potassium, 160 grains; Hypophosphite of Calcium, 160 grains; Hypophosphite of Manganese, 80 grains; Hypophosphite of Quinine, 80 grains; Hypophosphite of Strychnine, 2½ grains; Strong Solution of Hypophosphite of Iron (*B.P.C.*), 4 fl. oz.; Hypophosphorous Acid, 2 fl. drm.; Distilled Water, 3 fl. oz.; Glycerin, to produce 20 fl. oz.—*Bournemouth Formulary.*

This has been incorporated in the *B.P.C.* as follows:—

Glycerinum Hypophosphitum. *Syn.* GLYCEROL HYPOPHOSPHITIS.—Calcium Hypophosphite, 1·50; Manganese Hypophosphite, 0·75; Potassium Hypophosphite, 1·50; Quinine Hypophosphite, 0·75; Strychnine Hypophosphite, 0·025; Strong Solution of Ferric Hypophosphite, 20; Hypophosphorous Acid, 10; Distilled Water, 15; Glycerin, *q.s.* to produce 100.—*B.P.C.*

SYRUPUS HYPOPHOSPHITUM. — Calcium Hypophosphite, 45 grammes; Potassium Hypophosphite, 15 grammes; Sodium Hypophosphite, 15 grammes; Diluted Hypophosphorous Acid, 2 grammes; Sugar, 650 grammes; Tincture of Fresh Lemon Peel, 5 c.c.; Water, *q.s.* to make 1000 c.c.—*U.S.*

SYRUPUS CALCII HYPOPHOSPHITIS (*Squire*).—Dissolve Calcium Hypophosphite, 4 in Distilled Water, 38 add Sugar, 59; dissolve without heat and filter the Syrup.

Dose.—1 fl. drm. = 3·6 c.c. containing 3 grains = 0·2 gramme.

The *B.P.C.* Syrup is only one-third the strength, necessitating an excessive quantity of Syrup for a full dose of the salt.

SYRUPUS CALCII ET SODII HYPOPHOSPHITUM (*U.S.N.F.*).—Calcium Hypophosphite, 35; Sodium Hypophosphite, 35; Hypophosphorous Acid (*U.S.P.*), 1·5; Sugar, 775; Water, sufficient to make 1000.

1 fl. drm. contains 2 grains each of Calcium Hypophosphite and Sodium Hypophosphite.

The *B.P.C.* has incorporated the old formula (*U.S.N.F.* 1896) which employs Citric Acid.

Not Official.

CALCII IODAS.

CALCIUM IODATE.

A white, or more usually yellowish, very deliquescent, crystalline powder antiseptic and disinfectant. Under the name **Calcinol** it has been used as an antiseptic dressing in place of Iodoform.—*L.* '00, ii. 1867; *P.J.* '01, i. 27.

Dose.—1 to 3 grains = 0·06 to 0·2 gramme, two or three times daily in Water, as an intestinal antiseptic.

Tests.—The aqueous solution affords the tests characteristic of Calcium given in large type under Calcium Carbonate.

It affords with Silver Nitrate Solution a white precipitate, sparingly soluble in Water and in dilute Nitric Acid, but readily soluble in Ammonia Solution. When mixed with Potassium Iodide Solution it yields on the addition of Tartaric Acid Solution or a solution of an acid Sulphate and Starch Mucilage a fine blue coloration. Barium Chloride Solution produces a white precipitate practically insoluble in Water and difficultly soluble in Nitric Acid. On the addition of Sulphurous Acid to an aqueous solution Iodine is liberated, and may be recognised by the violet colour of its solution in Carbon Bisulphide or by the blue colour produced on the addition of Starch Mucilage.

Not Official.

CALCII IODIDUM.

This salt may be obtained from concentrated solutions in crystalline needles. By evaporating its solution to dryness it may be obtained as a white deliquescent fusible mass which crystallises on cooling. It is readily soluble in Water and in dilute Alcohol. It has recently (*B.M.J.* '06, ii. 138) been shown that great benefit is derived from its use in the treatment of ulcers, it had a remarkable effect in reducing thick callous edges into thin healing ones. It is given in doses of 2 to 4 grains (0·13 to 0·26 gramme).

Of great value in leg ulcers.—*B.M.J.* '07, i. 991.

Suggested that the gastritis which has sometimes followed its administration was due to free Iodine given off by the salt on exposure to a bright light or air. It should, therefore, be kept unexposed to light, and dispensed in suitably coloured bottles.—*B.M.J.* '07, i. 1464.

CALCII PHOSPHAS.

CALCIUM PHOSPHATE.

FR., PHOSPHATE DE CALCIUM; GER., CALCIUMPHOSPHAT; ITAL., FOSFATO DI CALCIO; SPAN., FOSFATO CALCICO.

A light, white, odourless and tasteless amorphous powder.

It is generally obtained commercially from Bone Ash. The Bone Ash is treated with Hydrochloric Acid and the resulting solution is precipitated with dilute Ammonia Solution, the precipitate being washed with cold Water to free it from Ammonium salts and dried at a temperature not exceeding 100° C. (212° F.). It is officially mentioned that it may be prepared by the interaction of Calcium Chloride and Sodium Phosphate, but it has been stated (*C.D.* '02, i. 190) that the salt produced by precipitation with the official Di-Sodium Hydrogen Phosphate is Di-Calcium Hydrogen Phosphate, and only in the event of Tri-Sodium Phosphate being used as a precipitant is a salt corresponding to the official requirements produced. A specimen produced by precipitation with Di-Sodium Hydrogen Phosphate when dissolved in Hydrochloric Acid and reprecipitated with Ammonia Solution showed a loss of over 29 p.c., whereas the official requirement is not less than 5 p.c.

Solubility.—Insoluble in Water; soluble in Diluted Hydrochloric Acid or Diluted Nitric Acid.

Medicinal Properties.—For rickets and mollities ossium, and other conditions of malnutrition; said to be useful in scrofulous affections, to promote union of bone fractures, in tardy teething, and in anæmia; given to counteract the draining of Phosphates during pregnancy and lactation, and to prevent decay of the teeth and toothache during pregnancy.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Prescribing Notes.—*More commonly ordered in smaller doses. Given as a powder, or in the form of Syrup.*

Official Preparations.—Contained in Extractum Euonymi Siccum and Pulvis Antimonialis.

Foreign Pharmacopœias.—Official in Austr., Belg., Ger., Hung., Russ. and Swiss (Calcium Phosphoricum); Dutch and Swed. (Phosphas Calcicus); Dan. (Phosphas Calcicus Præcipitatus); Fr. (Phosphate Di-acide de Calcium, Phosphate Mono-acide de Calcium and Phosphate Neutre de Calcium); Ital. (Fosfato Bicalcico); Jap. (Calcium Phosphoricum Præcipitatum); Mex. (Fosfato de Calcio); Port. (Phosphato de Cal); Span. (Fosfato Di-Calcico and Fosfato Tri-Calcico); U.S. (Calcii Phosphas Præcipitatus). Not in Norw.

Tests.—Calcium Phosphate when dissolved in Hydrochloric Acid answers the tests distinctive of Calcium given in the large type under Calcium Carbonate. Its solution in diluted Nitric Acid gives with Ammonium Molybdate Solution a yellow precipitate, which, when filtered off and washed, dissolves in Ammonia Solution, and affords on the addition of Magnesium Ammonio-sulphate Solution a white crystalline precipitate. The *B.P.* includes a method of gravimetrically determining the purity of the salt requiring that its Hydrochloric Acid Solution shall yield a white precipitate amounting to 95 p.c. by weight when reprecipitated with diluted Ammonia Solution, washed with cold Water and dried at 100° C. (212° F.). The *U.S.P.* states that it shall contain not less than 99 p.c. of pure Calcium Phosphate, but gives no method for its determination. The *P.G.* neither gives the requisite percentage nor a method of determination. The salt official in the *P.G.* is the Di-Calcium Phosphate and not the Tri-Calcium Phosphate.

The more generally occurring impurities are Aluminium, Arsenic, Copper, Iron, Lead, Magnesium, Carbonates, Chlorides, Silica and Calcium Oxalate. With the exception of the last named the *B.P.* group these collectively without any regard for their relative importance. Arsenic, the most important, is examined for in the *U.S.P.* by the modified Gutzeit's test, in the *P.G.* by Bettendorf's test. The *U.S.P.* employs the time-limit test, and *P.G.* Hydrogen Sulphide for the detection of Copper and Lead. Neither the *U.S.P.* nor *P.G.* includes a test for Magnesium or Silica. Calcium Oxalate is an unlikely impurity, and it has been questioned (*C.D.* '02, i. 190) whether the *B.P.* test for 'absence of Calcium Oxalate' is not a slip for 'absence of Alumina.' Both *U.S.P.* and *P.G.* state that when moistened with Silver Nitrate Solution the salt is coloured yellow, the *U.S.P.* mentions 'either before or after ignition,' which distinguishes it from Acid Calcium Phosphate, which, after ignition, remains white, when so moistened.

Potassium Sulphate.—5 c.c. of the solution prepared by means of Nitric Acid strongly acidulated with Nitric Acid should yield with 1 c.c. of Potassium Sulphate T.S. no turbidity upon standing, indicating the absence of Barium, *U.S.P.*

Silver Nitrate.—5 c.c. of a 1–20 solution prepared by the aid of Nitric Acid and acidulated with Nitric Acid yields with 0·5 c.c. of Silver Nitrate T.S. not more than a slight turbidity, *U.S.P.* The *P.G.* requires that a (1–20) aqueous solution of the salt obtained with Nitric Acid should be rendered at most opalescent with Silver Nitrate T.S. after 2 minutes.

Barium Nitrate.—If 1 part of Calcium Phosphate be shaken with 2 parts of Water, and the mixture filtered, the filtrate, after acidulating with Acetic Acid, should not be affected by Barium Nitrate Solution, *P.G.*

Stannous Chloride.—A mixture of 1 gramme Calcium Phosphate and 3 c.c. of Stannous Chloride Solution should not assume a dark colour in the course of an hour, *P.G.*

Hydrogen Sulphide.—The aqueous solution (1–20) obtained with Nitric Acid should give with excess of Solution of Ammonia on the addition of Hydrogen Sulphide T.S. a pure white precipitate, *P.G.*

Gutzeit's Test.—5 c.c. of a 1 in 10 solution of Calcium Phosphate in diluted Hydrochloric Acid should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Time-limit Test.—An aqueous solution (1–20) obtained by shaking the salt with Water, adding Hydrochloric Acid drop by drop and heating until solution is effected, should not respond to the time-limit test for heavy metals, omitting the addition of Ammonia Solution, *U.S.P.*

Not Official.

CALCII SULPHAS.

CALCIUM SULPHATE.

SULPHATE OF LIME. CALCINED GYPSUM. PLASTER OF PARIS.

FR., SULFATE DE CALCIUM; GER., GEBRANNTER GIPS; ITAL., GESSO CALCINATO; SPAN., YESO.

Native Calcium Sulphate ($CaSO_4$, $2H_2O$, eq. 170·81) rendered nearly anhydrous by heat.

A white odourless and tasteless powder.

It should be kept in well-closed jars, and should be protected as far as possible from moisture.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Fr., Ger., Hung., Jap., Mex., Norw., Russ., Swed., Swiss and U.S. Not in the others.

The native salt is used for the preparation of Calx Sulphurata.

Tests.—The distinguishing test for Calcium Sulphate is that when mixed with half its weight of Water it should form a smooth paste, rapidly becoming hard. The *P.G.* states that when so mixed it shall harden within 5 minutes. The saturated aqueous solution answers the tests characteristic of Calcium given in the large type under Calcium Carbonate; it should be neutral to Litmus paper, and should on the addition of Barium Chloride Solution yield a white precipitate, insoluble in Hydrochloric Acid.

The more generally occurring impurity is Carbonate, and the salt should not yield any effervescence when treated with dilute Hydrochloric or Nitric Acid.

ALX SULPHURATA (Calcii Sulphidum). *See* p. 302.

Not Official.

CALENDULA.

COMMON MARIGOLD.

The Florets of *Calendula officinalis*, L.

Foreign Pharmacopœias.—Official in U.S. Not in the others.

TINCTURA CALENDULÆ FLORUM.—1 of Marigold Flowers, dried, in No. 20 powder, percolated with Alcohol (60 p.c.), to yield 5.

This is included in the *B.P.C. Formulary* 1901.

Calendula, in No. 20 powder, 20; Alcohol (95 p.c.), 100. Prepared by percolation.—*U.S.P.*

This has been incorporated in the *B.P.C.*

Medicinal Properties.—Used as an application for sprains and bruises; internally for amenorrhœa.

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

Foreign Pharmacopœias.—Official in U.S., 1 in 5 (Alcohol 94·9 p.c.). Not in the others.

Not Official.

CALOTROPIS.

Syn.—MUDAR.

The dried root-bark of *Calotropis procera*, R. Br., and of *Calotropis gigantea*, R. Br., freed from the outer corky layer; dose 3 to 10 grains = 0·2 to 0·65 gramme, as a tonic; as an emetic, 30 to 60 grains = 2 to 4 grammes; and **Tinctura Calotropis** (1 in 10), dose 30 to 60 minims = 1·8 to 3·6 c.c.; are official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

CALUMBÆ RADIX.

CALUMBA ROOT.

FR., RACINE DE COLOMBO; GER., KOLOMBOWURZEL; ITAL., COLOMBO; SPAN., RAIZ DE COLOMBO.

The Root of *Jateorhiza Calumba*, Miers, cut in nearly circular transverse discs and dried.

The dried stem of *Coscinium fenestratum*, Colebr., (false Calumba Root) is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Medicinal Properties.—A bitter stomachic useful in chronic atonic dyspepsia, in promoting appetite, stimulating the gastric functions and removing flatulence. Given in convalescence from acute diseases, combined with alkalis or Bismuth. Like other bitters, Calumba ought not to be given in gastric ulcer, in acute gastritis, or when there is pain; nor ought it to be given for too long.

Prescribing Notes.—*Given in the form of Infusion, Liquor Concentratus, or Tincture with other medicines. It is one of the few bitters that can be given with salts of Iron.*

Official Preparations.—Infusum Calumbæ, Liquor Calumbæ Concentratus, and Tinctura Calumbæ.

Not Official.—Extractum Calumbæ, Fluidextractum Calumbæ, Infusum Calumbæ Concentratum.

Foreign Pharmacopœias.—Official in all.

Descriptive Notes.—Calumba root as met with in commerce varies much in character and quality, some specimens being of fresh appearance and yellowish tint, and others dull or greyish-yellow in colour and badly dried, and sometimes worm-eaten. The transverse or oblique slices average about 1½ inch (37 mm.) in diameter and about ⅓ inch (8 mm.) in thickness. The *B.P.* defines the size as about ⅛ to ½ inch (3 to 12 mm.) or more in thickness, and about 1 to 2 inches (2½ to 5 cm.) or more in diameter. The bark is ¼ inch or more in thickness, and harder and less shrunken than the starchy parenchymatous central portion, which is more or less depressed. The whole surface has a number of slender lines radiating from the centre and the bark is marked off by a darker cambium ring. The taste is bitter and mucilaginous and the odour characteristic. Under the microscope the distinctive features are the large irregular starch grains (0·09 mm. *P.G.*), a stellate hilum, and the irregularly thickened yellow sclerenchymatous cells in the bark, containing rhomboidal crystals of Calcium Oxalate. The active principle is not Berberine, as formerly supposed, but consists of two alkaloids resembling it (*P.J.* (4) xvi. p. 341). The infusion made with cold Water to avoid dissolving starch should be strained and then boiled to destroy a ferment or oxydase which causes the infusion, at first neutral, to become acid and turbid. To prevent the gum present from readily dissolving, the root is usually cut into small pieces instead of being pounded.

The root should be selected of good quality and of moderate size, as the larger pieces have less bark in proportion, and it is in this part that the activity of the drug chiefly resides. If old it is usually darker and duller in colour and more or less worm-eaten. A very bright colour usually indicates that the root has been washed and dried and may have lost some of its active principle. Calumba root is not often adulterated; sometimes small pieces with prominent woody wedges are occasionally found mixed with Calumba, but do not differ in the character of the starch or in taste, and are apparently pieces of the short underground stem from which the fusiform roots proceed. Another root has recently been found mixed with Calumba, resembling it in shape and size, but with a reddish tint, distinctly radiate structure, and containing bundles of acicular raphides in some parenchymatous cells and sphæraphides in others.

Preparations.

INFUSUM CALUMBÆ. Infusion of Calumba.

Calumba Root, 1; Distilled Water, cold, 20; infuse for half an hour; strain. (1 in 20)

Cold Water is used to avoid solution of the Starch which exists in the root.

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.

A corresponding preparation, **Infusum Coscinii,** is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Foreign Pharmacopœias.—Official in Belg., 1 of Fluid Extract in 20; Ital., 1 in 20; Span., 1 in 100. Not in the others.

LIQUOR CALUMBÆ CONCENTRATUS. CONCENTRATED SOLUTION OF CALUMBA.

An aqueous preparation of Calumba (preserved by the addition of Alcohol). 1 of Calumba in 2 of Liquor.

It contains 22·5 p.c. by volume of Alcohol (90 p.c.).

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Tests.—Concentrated solution of Calumba has a specific gravity of 0·990 to 0·996, it contains about 4 p.c. w/v of total solids and about 20 p.c. w/v of Absolute Alcohol.

A corresponding preparation, **Liquor Coscinii Concentratus,** is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

TINCTURA CALUMBÆ. TINCTURE OF CALUMBA.

1 of Calumba Root in No. 20 powder, macerated with 10 of Alcohol (60 p.c.). (1 in 10)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Tests.—Tincture of Calumba has a specific gravity of 0·915 to 0·920, it contains about 1 p.c. w/v of total solids and about 60 p.c. w/v of Absolute Alcohol.

A corresponding preparation, **Tinctura Coscinii,** is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Foreign Pharmacopœias.—Official in Belg., Fr., Mex., Port., Span., Swed., Swiss and U.S., 1 in 5; Ital. and Jap., 1 in 10; all except U.S. by weight. Not in the others.

Not Official.

EXTRACTUM CALUMBÆ.—Calumba Root exhausted with Alcohol (60 p.c.) and the product evaporated to a pill consistence. 16 parts of Root yield 1 to 1½ parts of Extract.

This has been incorporated in the *B.P.C.*

Dose.—½ to 2 grains = 0·03 to 0·13 gramme.

Foreign Pharmacopœias.—Official in Austr., Dutch, Hung. and Span., made with Alcohol (70 p.c.); Belg., Ital. and Mex., made with Alcohol (60 p.c.); Port., made with Alcohol (65 p.c.); Jap., made with Alcohol (45 p.c.); U.S., **Fluid Extract** only, made with Alcohol (about 66 p.c.). Not in Dan., Fr., Ger., Norw., Russ. or Swed.

FLUIDEXTRACTUM CALUMBÆ (*U.S.P.*).—A 1 in 1 Fluid extract prepared by macerating and percolating 1 of the Root with a mixture of 7 of Alcohol (94·9 p.c.) and 3 of Water. The Fluid Extract of the *Belg. Pharm.* is prepared from the Root with Alcohol (30°), the resultant fluid extract being required to contain at least 13 p.c. of dry residue.

INFUSUM CALUMBÆ CONCENTRATUM.—Calumba Root, in No. 10 powder, 40; Alcohol (90 p.c.), 25; Dilute Chloroform Water (1 in 100), *q.s.* to make 100; Prepare by macero-expression; the reserved liquid should be heated to 85° C., for 5 minutes before adding the Alcohol. Dose.—½ to 1 fl. drm.—*Farr* and *Wright; P.J.* '06, i. 165; '07, i. 621; *C.D.* '06, i. 252; *Y.B.P.* '07, 247.

This appears in the *B.P.C.*

CALX.

LIME.

FR., OXYDE DE CALCIUM; GER., GEBRANNTER KALK; ITAL., OSSIDO DI CALCIO; SPAN., CAL VIVA.

Calcium Oxide, **CaO**, eq. 55·59, obtained by calcining Chalk, Limestone, or Marble.

White or whitish, hard, odourless masses, possessing a characteristic caustic taste. When exposed to the atmosphere Lime rapidly absorbs Water and Carbonic Anhydride, and should therefore be kept in well-closed vessels, and protected as far as possible from contact with the air.

Solubility.—Decomposed by Water, forming Calcium Hydrate, under which heading the solubility is given.

Foreign Pharmacopœias.—Official in all.

Tests.—The distinguishing test for Lime is the heat evolved when mixed with about half its weight of Water, the masses swelling up and crumbling to powder. The *B.P.* mentions rather less than its own weight of Water, the *P.G.* with half its weight of Water, and the *U.S.P.* with about half its weight of Water, the *U.S.P.* and the *P.G.* stating, in addition, that with from 3 to 4 parts of Water, it forms a smooth magma. When mixed with Water and dissolved by the aid of Hydrochloric Acid, it yields a solution conforming to the distinctive tests for Calcium given in the large type under Calcii Carbonas Præcipitatus. The aqueous solution is alkaline in reaction towards red Litmus and to Phenolphthalein Solution. The *U.S.P.* requires that in the anhydrous state it shall contain not less than 90 p.c. of pure Calcium Oxide; the *B.P.* and *P.G.* specify no definite percentage. Neither Pharmacopœia refers to any method of quantitative determination.

The more generally occurring impurities are Aluminium, Iron, Magnesium, Potassium, Sodium, Carbonates, Chlorides, Phosphates, Sulphates, and Silica. These are grouped collectively in the *B.P.* The methods adopted for their detection in the case of Calcium Hydrate are applicable here also. The *P.G.* includes only a test for Carbonates and residue insoluble in Nitric Acid; the *U.S.P.* a limit of Carbonate, and a limit (0·5 p.c.) of matter insoluble in Hydrochloric Acid.

CALCII HYDRAS.—*See* p. 286.

CALX CHLORINATA.

CHLORINATED LIME.

FR., CHLORURE DE CHAUX; GER., CHLORKALK; ITAL., CLORURO DI CALCE.

A white, or greenish-white, dry, amorphous powder, evolving a strong chlorinaceous odour. Is a mixture of variable composition, consisting chiefly of Calcium Hypochlorite.

As it becomes moist and gradually decomposes on exposure to the air, it should be preserved in well-closed vessels in a cool and dry place.

Solubility.—Partially soluble in Water and in Alcohol (90 p.c.). Decomposed by acids with formation of Hypochlorous Acid, which in the case of Hydrochloric Acid reacts with it to form Chlorine.

Medicinal Properties.—Chiefly used as a disinfectant. A solution of 1 of Calx Chlorinata to 120 of Water is very powerfully antiseptic and is neither toxic nor caustic. Acts best at a temperature of 110° to 120° F.

A remarkably efficacious and absolutely harmless antiseptic. Useful as an external application in surgical, ophthalmic and gynæcological practice and also as an injection in affections of the rectum and bladder. *See* also below, Liquor Calcis Chlorinatæ.

Bleaching Powder frequently consists of little else than inert Calcium Chloride and Carbonate, the active Chlorine being spent. Generally speaking, it only destroyed the least resistant microbes, though in the case of anthrax spores on linen this substance proved more effective than Carbolic Acid.—*London County Council's Report on Disinfectants, L.* '02, i. 759.

Official Preparations.—Liquor Calcis Chlorinatæ. Used in the preparation of Chloroform and Liquor Sodæ Chlorinatæ.

Not Official.—Liquor Potassæ Chlorinatæ.

Foreign Pharmacopœias.—Official in Dan., Norw., Swed. (Calx Chlorata); Austr. and Russ. (Calcium Hypochlorosum); Fr. (Chlorure de Chaux); Belg., Ger., Hung., Jap. and Swiss (Calcaria Chlorata); Ital. (Cloruro di Calce); Mex. (Hipoclorito de Calcio Impuro); Port. (Cal Chlorada); Span. (Hipoclorito Calcico Clorurado); U.S. (Calx Chlorinata); Hung. and Norw., contain 20 p.c. of available Chlorine; Austr., Belg., Dan., Ger., Jap., Russ., Swed. and Swiss, 25 p.c.; Ital., 28·6 p.c.; Fr. 35 p.c.; Span., 32 p.c.; U.S. not less than 30 p.c.; Port., not indicated. Not in Dutch.

Tests.—The distinguishing tests for Calx Chlorinata are that when treated with Hydrochloric Acid it evolves a yellowish gas which at first reddens and then bleaches moistened blue Litmus paper; its aqueous solution decolorises Indigo Sulphate Solution; its Acetic Acid solution yields with Ammonium Oxalate Solution a white precipitate, insoluble in Acetic Acid, soluble in Hydrochloric Acid. It is officially required to contain 33 p.c. (more correctly 32·93 p.c.) of available Chlorine as indicated by titration of the Iodine liberated on mixing 0·5 gramme of the salt with 1·5 grammes of Potassium Iodide dissolved in 200 c.c. of Water and 6 c.c. of Hydrochloric Acid; at least 46·8 c.c. of Volumetric Sodium Thiosulphate Solution should be required. A detailed comparison of the *U.S.P.* and *P.G.* processes will be found below in the small type under the heading of Volumetric Determination. It should be noted that only a good and well-kept sample will yield the percentage of Chlorine required by the *B.P.* The *P.G.* requires 24·95 p.c. and the *U.S.P.* not less than 30 p.c. of available Chlorine, the latter Pharmacopœia triturating a definite weight of the substance with Water, making up to a standard volume and performing the assay on an aliquot portion.

Volumetric Determination.—The *P.G.* uses 0·5 gramme Calcaria Chlorata mixed with a solution of 1 gramme Potassium Iodide in 20 c.c. of Water, and acidulated with 20 drops Hydrochloric Acid, and directs that it should require at least 35·2 c.c. Tenth-normal Volumetric Sodium Thiosulphate Solution to combine with the liberated Iodine, *P.G.*

Introduce into a stoppered weighing bottle between 3 and 4 grammes of Chlorinated Lime and weigh accurately; triturate this thoroughly with 50 c.c. of Water, transfer the mixture to a graduated vessel, together with the rinsings, and add sufficient Water to make 1000 c.c. After thoroughly shaking add to 100 c.c. of the mixture 1 gramme of Potassium Iodide, 5 c.c. Diluted Hydrochloric Acid and sufficient Tenth-Normal Volumetric Sodium Thiosulphate Solution for complete decolorisation. Multiply the number of c.c. of Tenth-normal Volumetric Solution consumed by 0·3518, and divide the product by one-tenth of the weight of the Chlorinated Lime taken; the quotient represents the percentage of available Chlorine present, *U.S.P.*

Preparations.

LIQUOR CALCIS CHLORINATÆ. Solution of Chlorinated Lime.

Chlorinated Lime, 1; Distilled Water, 10. (1 in 10)

The Chlorinated Lime should be thoroughly mixed with the Water, and set aside in a stoppered bottle for three hours, shaking it at intervals, and finally strained through calico.

The Solution should yield, when fresh, about 3 p.c. of available Chlorine, but is liable to deterioration on keeping. It should be preserved in well-stoppered amber-coloured bottles and kept in a cool and dark place.

Medicinal Properties.—A powerful disinfecting and bleaching agent. Diluted 1 to 12 or 16 of Distilled Water, it is used as an antiseptic **lotion** for unhealthy ulcers, purulent ophthalmia, fetid cutaneous affections and scabies; as an **injection** in foul nasal, aural and vaginal discharges; as a **gargle** in septic tonsillitis and diphtheria.

Antidotes.—Emetics, White of Egg, Milk, Flour; *not* Acids.

Foreign Pharmacopœias.—Official in Belg., 3 in 100; Russ. (Calcium Hypochlorosum Solutum), 2·5 p.c. of Chlorine; Span., about 1 in 43. Not in the others.

Tests.—The distinguishing tests for Chlorinated Lime Solution are that it has a specific gravity of about 1·055 and shall yield not less than 2 p.c. of available Chlorine as determined by titration of the Iodine liberated, when 1 gramme of the liquor is mixed with 0·5 gramme of Potassium Iodide dissolved in Water and 1 c.c. of Hydrochloric Acid added; not less than 5·6 c.c. of Deci-normal Volumetric Sodium Thiosulphate should be required, corresponding to 1·97 p.c. of available Chlorine.

LIQUOR SODÆ CHLORINATÆ.—Solution of Chlorinated Soda.

An almost colourless liquid possessing an alkaline reaction, an astringent taste and a faint chlorinaceous odour. It is prepared by well rubbing 4 of Chlorinated Lime with 30 of Distilled Water and mixing this with 6 of Sodium Carbonate previously dissolved in 10 of Distilled Water, and filtering.

The method of preparation adopted in the *B.P.* 1885 recommended the solution of the Chlorinated Lime to be filtered, the solutions to be well mixed and again filtered. The *Companion*, 1894 edition, pointed out that this was unadvisable, and the method was altered in accordance with the *Companion* recommendation in the 1898 edition of the *B.P.*

It should be kept in well-stoppered amber-tinted glass bottles and in a cool and dark place. It has the reputation of being an unstable solution, but this is an error. It undergoes but slight change, even when kept under ordinary conditions during several months, or even after keeping for a week in an open white glass bottle.

The Labarraque Solution was prepared by mixing together the unfiltered solutions of one part of Chlorinated Lime with 2 parts of Soda crystals.

The proportions used in U.S. and other Pharmacopœias will be found below.

Medicinal Properties.—Antiseptic. Used internally in typhoid fever and in dysentery. Invaluable as a **gargle** in throat affections attended with fœtor, as in scarlet fever, diphtheria and septic tonsillitis, 1 fl. oz. in 12 to 16 fl. oz. of Water. Diluted with Water or Glycerin it forms an excellent application to sore nipples. It is also a powerful disinfecting agent, and is employed as a wash for foul ulcers.

For information on the treatment of typhoid and diphtheria by Chlorine *see* under 'Chlori Liquor.'

A paper by Klein on the disinfecting action of solutions of Sodium Hypochlorite.—*L.* '96, ii. 1509.

Dose.—10 to 20 minims = 0·6 to 1·2 c.c.

Foreign Pharmacopœias.—Official in Fr. (Chlorure de Soude dissous), Chlorinated Lime 1, Sodium Carbonate 2, Water 45; Mex. (Hipoclorito de Sodio liquido), Sodium Chloride 3, Manganese Dioxide 3, Sulphuric Acid 3, Sodium Carbonate 5, Distilled Water 20; Port. (Soluto de Soda Chlorada), Calcium Hypochlorite 1, Sodium Carbonate 2, Water 40; Span. (Solucion de Hipochlorito Sodico), Calcium Hypochlorite 1, Sodium Carbonate 2, Water 43; Swiss (Natrium Hypochlorosum Solutum), Calcium Hypochlorite 4, Sodium Carbonate 5, Water 120; U.S., Chlorinated Lime 90, Monohydrated Sodium Carbonate 65, Water to weigh 1000. Not in the others.

Tests.—Chlorinated Soda Solution has a specific gravity of about 1·054; it decolorises Indigo Sulphate Solution, and yields when acidified with Hydrochloric Acid a yellowish-green gas possessing a strong chlorinaceous odour and which first reddens and then bleaches moistened blue Litmus paper. It is officially required to indicate at least 2·51 p.c. of available Chlorine as determined by the titration of the Iodine liberated when 3·5 grammes of the solution are added to a solution of 1 gramme of Potassium Iodide in 100 c.c. of Water and the mixture acidulated with 3 c.c. of Hydrochloric Acid; at least 25·0 c.c. of Volumetric Sodium Thiosulphate Solution should be required. The *U.S.P.* requires it to contain at least 2·4 p.c. by weight of available Chlorine, as volumetrically determined by mixing a weighed quantity of 7 grammes of the solution with 50 c.c. of Water and 2 grammes of Potassium Iodide, adding 10 c.c. of Hydrochloric Acid and titrating the liberated Iodine with Tenth-normal Volumetric Sodium Thiosulphate Solution, of which not less than 48 c.c. should be required; 1 c.c. of Tenth-normal Volumetric Sodium Thiosulphate Solution is equivalent to 0·05 p.c. of available Chlorine. The preparation is not official in the *P.G.*

The more generally occurring impurities are Calcium and Carbonates. When acidified with Acetic Acid and warmed till Chlorine vapours cease to be evolved, it should not yield a pronounced turbidity on the addition of Ammonium Oxalate Solution, indicating the absence of more than a trace of Calcium; the gas evolved when the liquor is acidified with diluted Hydrochloric Acid should not cause a turbidity when passed into Lime Water, indicating the absence of Carbonates.

Not Official.

LIQUOR POTASSÆ CHLORINATÆ (Eau de Javelle).—Prepared by the interaction of Bleaching Powder and Potassium Carbonate. Contains about 3 p.c. available Chlorine.

CALX SULPHURATA.

SULPHURATED LIME.

Syn.—Calcii Sulphidum.

A white, or greenish-white amorphous powder possessing a characteristic odour of Hydrogen Sulphide. Should contain not much less than half its weight of Calcium Sulphide CaS., eq. 71·53, with Calcium Sulphate and Carbon.

It may be prepared by the reduction of native Calcium Sulphate by Carbon.

It should be kept in amber-tinted glass stoppered bottles and in a cool and dry place, as it is gradually decomposed by exposure to moist air.

Medicinal Properties.—Antisuppurative; internally for boils, pustules and abscesses. In the form of Pigmentum or Lotio Calcii Sulphurati for the cure of scabies; also used as a depilatory.

Daily doses of 1 grain as a prophylactic of influenza.—*B.M.J.* '95, i. 975.

Dose.—¼ to 1 grain = 0·016 to 0·065 gramme.

Prescribing Notes.—*Best prescribed in* pill, *made with Glucose. If the total weight of each pill be less than ½ grain it is made up to this weight with Milk Sugar. The pills are coated with Sandarach solution, and usually sent out in bottles.*

Foreign Pharmacopœias.—Official in Jap., Mex., Port. and U.S. Not in the others.

Tests.—The distinguishing tests for Calcium Sulphide are that when acidulated with Acetic Acid it evolves a gas having a powerful odour of Hydrogen Sulphide, leaving a residue of Calcium Sulphate and Carbon, and when filtered the filtrate yields with Ammonium Oxalate solution a white precipitate insoluble in Acetic, but soluble in Hydrochloric Acid. Both *B.P.* and *U.S.P.* employ the Copper Sulphate test as a means of determining the presence of a due proportion of Sulphide; the *B.P.* requiring that a solution of 1·4 grammes of

Copper Sulphate in 50 c.c. of Water shall, when acidified with Hydrochloric Acid and brought nearly to the boiling point, be completely precipitated by 0·8 gramme of Calx Sulphurata, indicating not much less than 50 p.c. of pure Calcium Sulphide; the *U.S.P.* that a solution of 1·9 grammes of Cupric Sulphate, when treated as indicated below shall be completely precipitated by 1 gramme of the substance, indicating the presence of at least 55 p.c. of pure Calcium Sulphide. The *B.P.* employs Potassium Ferrocyanide Solution, the *U.S.P.* excess of Ammonia Water to detect excess of Copper. Calx Sulphurata is not official in the *P.G.*

The Zinc process described under Barium Sulphide is also applicable to Calx Sulphurata.

Determination.—The *U.S.P.* gives a similar test, using 1 gramme of Sulphurated Lime with a cold solution of 1·9 grammes of Copper Sulphate in 50 c.c. of Water and the addition of 10 c.c. diluted Hydrochloric Acid in small portions. The mixture is directed to be digested on a water-bath for 15 minutes and filtered. The addition of an excess of Ammonia Water to the filtrate should impart no colour to it.

Not Official.

SOLUTIO CALCII OXYSULFURATI (Solutio Vlemingkx).—1 of Calcium Oxide slaked with 1 of Water, and mixed with 2 of washed Sulphur: of the foregoing mixture 2·5 is boiled with 20 of Water until it is so reduced as to yield 10 by weight when strained.—*Austr.*

1 of Calcium Oxide is treated with 5 of Water, and 2 of washed Sulphur with 15 of Water; mix and boil for one minute; when cold filter and wash the residue with Water to yield 12.—*Swiss.*

Calcium Sulfuratum Solutum.—Calcium Oxide, 10; Sulphur, 25; Water, 100.—*Belg.*

Various formulas have been given for Vlemingkx's Solution: the proportion of Calcium Oxide, Sulphur and finished product varies between 2, 4, 20; 3, 5, 20; 2·5, 5, 20; 4, 4, 20.

Lotio Calcii Sulphurati.—Calcium Hydrate, 4; Sublimed Sulphur, 4; Water, 35. Boil together, evaporate and filter, to produce 20 of solution. To be diluted with an equal quantity of warm Water.—*Westminster.*

Liquor Calcis Sulphuratæ.—Quicklime, 2; Sublimed Sulphur, 5; Water, *q.s.* to produce 100.—*B.P.C.*

CAMBOGIA.

GAMBOGE.

FR., GOMMEGUTTE; GER., GUMMIGUTT; ITAL., GOMMAGOTTA; SPAN., GUTAGAMBA.

A gum-resin obtained from *Garcinia Hanburii*, Hook. f.

It is imported from Siam, and consists of about 75 p.c. of Resin and 15 to 20 of Gum, the Resin being the active ingredient.

Indian Gamboge, obtained from *Garcinia Morella*, Desr., is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Solubility.—About three-fourths is soluble in Alcohol (90 p.c.), the solution is rendered an opaque yellow by Water; three-fourths is also soluble in Ether. A solution in Ammoniated Alcohol is not rendered turbid by the addition of Water.

Medicinal Properties.—A powerful hydragogue cathartic; in small doses, diuretic. It is employed in the treatment of dropsy, attended with obstinate constipation; and in cerebral congestion. As it is apt to occasion much sickness and griping, it is best given in small doses, repeated at short intervals, until it operates; but it should never be given to children or very old persons, or in inflamed conditions of the abdominal or pelvic organs.

Dose.—$\frac{1}{2}$ to 2 grains = 0·032 to 0·13 gramme.

Ph. Ger. maximum single dose, 0·3 gramme; maximum daily dose, 1·0 gramme.

Prescribing Notes.—*It may be given in pill or emulsion, or dissolved in an alkaline solution; the last method has been recommended in dropsy.*

Official Preparation.—Pilula Cambogiæ Composita.

Foreign Pharmacopœias.—Official in Austr. (Gummiresina Gutti); Belg. (Guttæ Gummi); Fr., Ger. (Gutti); Ital., Mex. (Goma Guta); Port. (Gomma-Guta); Span., Swed. (Gummi-Resina Gutta); Swiss, U.S. (Cambogia). Not in the others.

Descriptive Notes.—It usually presents the cylindrical shape of the bambco joints in which it is collected; it may be solid or hollow in the centre. If of good quality it has a smooth, even fracture, free from grittiness, of a bright orange colour. Inferior qualities have a dull and sometimes gritty fracture. The same remarks apply to Indian Gamboge.

Tests.—The distinguishing tests for Gamboge are that when rubbed with Water it forms a yellow emulsion; that it should be completely dissolved by the successive use of Alcohol (90 p.c.) and of Water. It has been suggested (*P.J.* '02, ii. 495) that 75 p.c. should be soluble in Alcohol (90 p.c.), which agrees with the statement previously made in the *Companion* that three-fourths should be soluble in Alcohol (90 p.c.). This standard has been adopted by the *U.S.P.* using Alcohol (94·9 p.c.), but *P.G.* makes no reference to an Alcohol solubility.

The more generally occurring adulterants are Starch, mineral matter, and vegetable debris. Starch may be detected by the addition of Iodine to the cooled aqueous decoction; mineral matter by the ash left on incineration and vegetable matter by the increased insolubility in Alcohol (90 p.c.). The *B.P.* and *U.S.P.* require that when incinerated it shall yield not more than 3 p.c. of ash; the *P.G.* not more than 1 p.c.

Gamboge of good commercial quality contains from 60 to 80 p.c. of Resin (Gambogic Acid); from 15 to 25 p.c. of Gum; about 4 p.c. of Wax; moisture, mineral matter and a trace of Starch.

The *B.P.* states that it is completely dissolved by the successive action of Alcohol (90 p.c.) and Water; and the *U.S.P.* that not more than 25 p.c. should be insoluble in Alcohol (94·9 p.c.).

Preparation.

PILULA CAMBOGIÆ COMPOSITA. Compound Pill of Gamboge.

Gamboge, 1; Barbados Aloes, 1; Hard Soap, 2; all in powder;

Compound Powder of Cinnamon, 1; massed with Glucose Syrup. (about 1 in 6)

Dose.—4 to 8 grains = 0·26 to 0·52 gramme.

Foreign Pharmacopœias.—Official in Fr. (Pilule Anderson), Aloes, Gamboge, Oil of Anise, and Honey; Port. (Pilulas de Aloes e Gomma Guta), the same with Soap; Mex. (Pildoras de Anderson), Aloes 8, Gamboge 8, Oil of Anise 0·4, Soap 4, Water *q.s.*, also (Pildoras de Boncio), Aloes 7, Gamboge 7, Ammoniacum 7, Soap 4, Water *q.s.*; U.S. (Pil. Catharticæ Comp.), contains Gamboge about 1 in 12 (*see* Colocynth). Not in the others.

CAMPHORA.

CAMPHOR.

Fr., Camphre du Japon; Ger., Kampher; Ital., Canfora; Span., Alcanfor.

Refined Camphor is a white or colourless translucent crystalline solid. It is obtained in the raw state from *Cinnamomum Camphora*, Nees and Eberm., in Formosa and Japan; it is resublimed in this country and elsewhere.

It may also be produced synthetically by the oxidation of Camphene. Camphene exists in many essential oils, but commercially it is obtained from Pinene Hydrochloride or Borneol Hydrochloride by treatment with Alcoholic Potassium Hydroxide.

On account of its volatility it should be kept in well-closed vessels, and in a cool place.

Borneo Camphor (**Borneol**) is a solid substance obtained from *Dryobalanops aromatica*, Gärtn., in Borneo and its neighbourhood. Borneol is used in the production of artificial Camphor; two compound esters are known, Borneol Salicylate (Salit) and Borneol Valerianate (Bornyval).

Solubility.—1 in 700 of Water; 1 in 1¼ of Alcohol (90 p.c.); or by weight, 1 in 1; 4 in 1 of Chloroform; 12 in 7 of Ether; 1 in 4 of Olive Oil (slowly); 1 in 1½ of Oil of Turpentine; 2 in 1 of Glacial Acetic Acid; insoluble in alkalis.

3 of Camphor rubbed with 1 of Carbolic Acid crystals form a clear solution. 3 of Camphor and 3 of Chloral Hydrate rubbed together liquefy. Camphor also forms a liquid when mixed with many other substances, Menthol, Thymol, Naphthol, Salol, Butyl Chloral, and Salicylic Acid.

Medicinal Properties.—A stimulant sedative; antispasmodic, carminative, expectorant, diaphoretic, and anaphrodisiac. A local anæsthetic. A feeble antiseptic.

Stimulant in the prostration of febrile diseases; sedative in mania, delirium tremens and chordee, also useful in dysmenorrhœa, spasmodic asthma and chronic bronchitis; in hysteria, nymphomania and spermatorrhœa. Spirit of Camphor mixed with warm Water to bathe the nostrils is highly useful in hay fever, and relieves irritation of the nostrils in common cold; also used as an **inhalation.** The **Compound Tincture** is given with Tincture of Squill to allay spasmodic cough in bronchitis and phthisis. In large doses Camphor tends to cause cardiac depression, convulsions, and possibly collapse.

Externally, it is used as a counter-irritant to relieve pain in chronic rheumatism, neuralgia, and as an application to chilblains; also in chronic eczema and other painful skin diseases. The combination with Thymol, Phenol, or Chloral forms a good local anodyne for neuralgia.

10 grammes of 10 p.c. solution of Camphor in Olive Oil hypodermically injected for collapse.—*B.M.J.E.* '95, ii. 63; *P.J.* '95, ii. 380.

Dose.—2 to 5 grains = 0·13 to 0·32 gramme.

Prescribing Notes.—*An excellent pill can be made by mixing Camphor,* 36 *grains; Curd Soap,* 4 *grains;* '*Diluted Glucose,*' 10 *grains; and dividing into* 12 *or more pills as required. Its unpleasant taste is covered well by Milk, which is a good solvent for Camphor. The* **Spirit** *is given on Sugar, also in Milk. Camphor can be powdered quite readily with the addition of a small quantity of Alcohol* (90 *p.c.*).

Symptoms of poisoning by Camphor: convulsions, lividity, stupor, arrest of urinary secretion.

Official Preparations.—Aqua Camphoræ, Linimentum Camphoræ, Linimentum Camphoræ Ammoniatum, Spiritus Camphoræ and Tinctura Camphoræ Composita. Contained in Linimentum Aconiti, Linimentum Belladonnæ, Linimentum Opii, Linimentum Saponis, Linimentum Sinapis, Linamentum Terebinthinæ and Unguentum Hydrargyri Compositum. Of **Linimentum Camphoræ:** Linimentum Chloroformi, Linimentum Hydrargyri, Linimentum Terebinthinæ Aceticum.

Not Official.—Aqua Camphoræ Conc., Camphor Ball, Camphora cum Creta, Camphorated Quinine, Ceratum Camphoræ, Essentia Camphoræ, Spiritus Camphoræ Fortior, Æther Spirituosus Camphoratus, Spiritus Camphoræ Compositus, Syrupus Camphoræ Compositus, Vinum Camphoratum, Essential Oil of Camphor, Eau Sedative, Camphor Salicylate, Oxycamphor, Phenol Camphor, Thymol Camphor, Resorcin Camphor, and Camphoric Acid.

Antidotes.—Stomach-tube or emetics, stimulants freely, and warmth to the extremities.

Foreign Pharmacopœias.—Official in all.

Descriptive Notes.—It occurs in commerce in the form of 'Bells,' in rectangular pieces (Camphor squares) or in a pulverulent condition (Flowers of Camphor). It possesses a characteristic, powerful and penetrating odour and a pungent aromatic taste, subsequently producing a feeling of coldness in the mouth. It is described by the *U.S.P.* as the dextrogyrate modification of the saturated ketone $C_9H_{16}CO$. Squares containing Stearic Acid have been met with on the Continent. Genuine Camphor of Japanese manufacture has often an odour of Saffrol, which is less noticeable in Chinese or Formosa Camphor. Artificial Camphor has usually a faintly terebinthinate odour, and is liable to contain traces of Chlorine. Recently under the name of Pearl Camphor an artificial Camphor made in Germany and having a very pure odour has been offered in commerce in the form of small cylindrical pieces about $\frac{1}{6}$ in. (4 mm.) in diameter.

Tests.—The distinguishing tests for Camphor are its distinctive odour and physical appearance, the specific gravity (which should be 0·995), the melting point, which should be 175° C. (347° F.), and the boiling point, which should be 205° C. (401° F.). The *B.P.* only gives the specific gravity, which it states should be about 0·995; the

U.S.P. gives 0·990 at 25° C. (77° F.); the *U.S.P.* and *P.G.* give the melting point as 175° C. (347° F.); the *U.S.P.* gives the boiling point as 204° C. (399·2° F.); the *P.G.* gives neither specific gravity nor boiling point.

The more generally occurring impurity is mineral matter, which is detected by the residue left on ignition. Artificial or synthetic Camphor is sometimes used, and the *U.S.P.* includes a test for Chlorinated compounds, which are indicative of the synthetic article; the test which is peculiar to the *U.S.P.* is described below in small type under the heading of Silver Nitrate. The solution in Alcohol (90 p.c.) should be neutral to Litmus; should Stearic Acid be present the solution would be acid, and the quantity could be ascertained by determining the Acid value.

Silver Nitrate.—The *U.S.P.* gives the following test to detect chlorinated products. If a small piece of Camphor be dropped into a small porcelain dish, and a clean beaker moistened on the inner surface with Distilled Water be inverted over the smaller dish immediately after igniting the Camphor, a part of the products of combustion will be absorbed by the Water; if the beaker be rinsed with a little Distilled Water and the liquid filtered, the filtrate should yield no turbidity upon the addition of a few drops of Silver Nitrate T.S.

Preparations.

AQUA CAMPHORÆ. Camphor Water.

Dissolve 70 grains of Camphor in Alcohol (90 p.c.) *q.s.* to form ½ fl. oz.; add this gradually to 160 oz. of Distilled Water, with agitation to form a solution. (1 in 1000)

The solution of the Camphor in Alcohol saves time and ensures a more uniform product. The alcoholic solution of Camphor may be kept ready for use.

Dose.—1 to 2 oz. = 28·4 to 56·8 c.c. = $\frac{7}{16}$ to $\frac{7}{8}$ grain of Camphor.

Foreign Pharmacopœias.—Official in Belg., Camphor 2, Alcohol 4, Water 994; Dan. (Mistura Camphorata), contains Camphor, Alcohol, Mucilage of Acacia, Syr. Cerasi and Water; Norw. (Emulsio Camphoræ), Camphor, Mucilage of Acacia, and Water; Port., Camphor 1, Water 100; Span. (Emulsio Alcanforado), Camphor, Sweet Almonds, Powdered Sugar, and Water; Swed. (Emulsio Camphoræ), Camphor, Gum Acacia, and Almond Emulsion; U.S., dissolve 8 of Camphor in 8 c.c. of Alcohol (95 p.c.) and triturate the solution with 15 of Purified Talc, and, after allowing the greater part of the Alcohol to evaporate spontaneously, continue the trituration with Distilled Water gradually added to make 1000 c.c.; then pour the mixture upon a well wetted filter, and pass the filtrate through the filter repeatedly until the Camphor Water is perfectly clear. Not in the others.

LINIMENTUM CAMPHORÆ. Liniment of Camphor. *B.P.Syn.*—Camphorated Oil.

A yellow oily fluid, possessing a strong characteristic odour of Camphor, prepared by dissolving 1 of Camphor in flowers, in 4 of Olive Oil. (about 1 in 5)

Solution will be more readily effected if the Camphor is sifted before using, and if the oil is warmed to about 38° C. (100·4° F.); agitating in a bottle or covered vessel to prevent vaporisation of the Camphor.

Foreign Pharmacopœias.—Official in Dan., Jap., Norw. and Swed., 1 and 4; with Olive Oil; Belg., 1 and 9; with medicinal oil; Dutch (Solutio Camphoræ Oleosa), Fr., Ger., Ital., Span. (Aceite Alcanforado), and Swiss, 1 and 9, all with Olive Oil; Port., 1 and Almond Oil 9; Austr. (Oleum Camphoratum), 1 and 3; Mex. (Aceite Alcanforada), 1 in 9; Hung., 1 and 2; Russ., 1 and 9; all with Sesame Oil; U.S., 1 and Cotton Seed Oil 4. All by weight. Ger. also includes Oleum Camphoratum Forte, 1 and 4.

Tests.—Camphorated Oil has a specific gravity of 0·920 to 0·926, and should theoretically contain 21·45 p.c. w/w of Camphor, which may be determined by heating a definite weight of the sample in a flat-bottomed dish on a water-bath until it ceases to lose weight. Olive Oil is stated (*Analyst* xxiii. 281) to suffer a gain in weight of 0·15 p.c. when heated for two hours at 120° C. (248° F.), and hence this figure should be added to the loss in weight when testing the samples under those conditions in order to obtain the true amount of Camphor present. But it has been subsequently shown (*C.D.* '01, i. 168) that it is best to make no such correction but to take the percentage of loss in weight as equal to the quantity of Camphor present.

Samples of the Liniment are frequently deficient in Camphor, and the loss of Camphor by volatilisation has been pleaded in justification of such deficiency, but it is generally conceded that if properly prepared it will not, when kept under ordinary conditions, lose any appreciable amount. The *U.S.P.* uses Cotton Seed Oil in the preparation of the Liniment, and Sesame Oil is employed by some of the Foreign Pharmacopœias. Mineral Oil or a mixture of a mineral and vegetable oil has been used as an adulterant, but their presence is readily detected by determining the percentage of Potassium Hydroxide required to saponify the residue remaining after the volatilisation of the Camphor. The refractive index of the oil is apparently almost unaffected by the presence of dissolved Camphor (*Analyst* xxv. 202), and the refractometer may be employed for the identification of the oil used. It is shown (*C.D.* '01, ii. 390) that the substitution of other oils for Olive Oil may, with the exception of Arachis Oil, be readily detected. The determination of the optical activity has also been suggested (*Analyst* xxv. 202) as a means of ascertaining the percentage of Camphor present in a sample. The rotation is increased by nearly 1° for each percentage of Camphor present, and the observed rotation of a sample in a 200 mm. tube gives at once, without calculation, the percentage of Camphor with sufficient accuracy for most purposes. It has been pointed out (*C.D.* '01, i. 167) that they show a slight over-estimation, the error varying with the amount of Camphor present; when 25 p.c. of Camphor is present the division will be 0·998, while with 1 p.c. it will be 0·987.

LINIMENTUM CAMPHORÆ AMMONIATUM. AMMONIATED LINIMENT OF CAMPHOR. *B.P.Syn.*—COMPOUND LINIMENT OF CAMPHOR. *N.O.Syn.*—LINIMENTUM AMMONIATUM CAMPHORATUM.

Camphor, 5; Oil of Lavender, ¼; Strong Solution of Ammonia, 10; Alcohol (90 p.c.), *q.s.* to make 40. (1 in 8)

Dissolve the Camphor and the Oil in a portion of the Alcohol (about 24) and add the Ammonia gradually with agitation. The Camphor which is at first thrown out will readily redissolve. Add Alcohol *q.s.* to make 40.

Rubefacient and counter-irritant. Most useful in tic-douloureux and chronic rheumatism. Painful neuralgia is relieved by applying lint previously soaked in the liniment, covering with a dry napkin until redness is produced, then lightly rubbing the part with Laudanum or Liquor Meconicus.

Foreign Pharmacopœias.—Official in Belg. (Linimentum Ammoniacale Camphoratum), Liquid Ammonia 1, Camphorated Oil 9; also (Camphoræ Linimentum Compositum), Spirit of Soap 700, Spirit of Camphor 250, Liquid Ammonia 30, Oil of Rosemary 15, Oil of Thyme 5; Dan., Solution of Ammonia 5, Camphor 1, Rape Oil 14; Fr., Solution of Ammonia 1, Camphorated Oil 9; Ger., Solution of Ammonia 1, Camphorated Oil 3, Poppy Oil 1; Ital., Solution of Ammonia 1, Camphorated Oil 4; Mex., Solution of Ammonia 1, Camphorated Oil 9; Norw., Solution of Ammonia 2, Camphorated Oil 1, Rape Oil 2; Port., Liquid Ammonia 1, Camphorated Oil 4; Russ., Solution of Ammonia 1, Camphorated Oil 3, Sesame Oil 1; Span., Solution of Ammonia 1, Camphorated Oil 9; Swed. and Swiss, Solution of Ammonia 1, Camphorated Oil 3. All by weight. Not in the others.

Linimentum Ammoniæ cum Camphora.—Solution of Ammonia, 25; Liniment of Camphor, 25; Olive Oil, *q.s.* to produce 100.—*B.P.C. Supplement.*

SPIRITUS CAMPHORÆ.

SPIRIT OF CAMPHOR. *N.O.Syn.*—TINCTURA CAMPHORÆ.

Camphor, 1; Alcohol (90 p.c.), *q.s.* to make 10. (1 in 10)

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

Foreign Pharmacopœias. — Official in Austr., Belg., Dan., Dutch (Solutio Camphoræ Spirituosa), Fr. (Teinture de Camphré Conc.), Ger., Ital., Jap., Norw., Port., Swed., Swiss and U.S., 1 in 10; Hung., about 1 in 7; Russ., 1 in 13; Mex. (Alcohol Alcanforada), 1 and 19; Span., 1 and 24; Fr. has also a Teinture de Camphre faible, Camphor 1, Dilute Alcohol 39. All by weight except U.S.

Tests.—Spirit of Camphor has a specific gravity of 0·843 to 0·847. It should contain 10 p.c. w/v of Camphor, which may be determined by its optical rotation.

A paper on the determination of Camphor in Spirit of Camphor appears in *C.D.* '99, i. 154.

A process requiring less manipulative skill, and which is claimed to give very exact results, appears in *Y.B.P.* '01, 47. A weighed quantity of 10 grammes of the spirit is introduced into a 50 c.c. burette, graduated in $\frac{1}{10}$ c.c. and shaken with 30 to 35 c.c. of a saturated solution of Sodium Chloride. 1 c.c. of Petroleum Ether is dropped on the Camphor layer when it has collected as much as possible on the surface, and solution of the Camphor effected by careful agitation. After several minutes the volume of the Benzin solution can be read off. After subtracting the volume of added Benzin each further 1·02 c.c. will correspond to 1 gramme of Camphor (sp. gr. 0·98).

TINCTURA CAMPHORÆ COMPOSITA.

COMPOUND TINCTURE OF CAMPHOR. *B.P.Syn.*—PAREGORIC. PAREGORIC ELIXIR.

Tincture of Opium, 585 minims; Benzoic Acid, 40 grains;

Camphor, 30 grains; Oil of Anise, ½ fl. drm.; Alcohol (60 p.c.), *q.s.* to make 20 fl. oz.

Dissolve the Benzoic Acid, Camphor, and Oil of Anise in a portion of the Alcohol (about 17 or 18); add the Tincture and finally Alcohol *q.s.* to make 20 fl. oz.

B.P. 1898 replaced the 40 grains of Opium by the corresponding quantity of Tincture of Opium, 585 minims, as previously suggested in the *Companion*.

The Pimpinella Oil is preferable as being more soluble in Alcohol (60 p.c.).

Dose.—30 to 60 minims = 1·8 to 3·6 c.c. = ⅛ to ¼ grain Opium.

30 minims contain about $\frac{1}{80}$ grain of anhydrous Morphine (about $\frac{1}{60}$ grain of Morphine Hydrochloride), corresponding to 0·046 p.c. w/v of anhydrous Morphine.

The *Brussels Conference* agreed that Tinctura Opii Benzoica, the equivalent in the Foreign Pharmacopœias of our Compound Tincture of Camphor shall contain 0·05 p.c. w/w of Morphine. Tinctura Camphoræ Co. *B.P.* contains 0·05 p.c. (more correctly 0·046 p.c.) w/v of anhydrous Morphine.

Official Tincture of Opium contains 0·75 p.c. of anhydrous Morphine.

Foreign Pharmacopœias.—Official in Belg. (Opii Tinctura cum Acido Benzoico), Tincture of Opium 50, Benzoic Acid 5, Camphor 3, Anethol 2, Alcohol (70 p.c.), 940; Dan. (Tinctura Thebaiaca Benzoica), Tincture of Opium 50, Benzoic Acid 5, Camphor 3, Oil of Anise 2, Diluted Alcohol 940; Dutch (Tinctura Opii Benzoica), Tincture of Opium 10, Benzoic Acid 4, Camphor 2, Oil of Anise 1, Diluted Alcohol 183; Fr. (Elixir Paregorique), Opium 5, Benzoic Acid 5, Camphor 2, Oil of Anise 5, Alcohol (60 p.c.), 985; Ger. and Russ. (Tinctura Opii Benzoica), Opium 1, Benzoic Acid 4, Camphor 2, Oil of Anise 1, Diluted Alcohol 192; Jap., Opium 1, Benzoic Acid 4, Purified Camphor 2, Fennel Oil 1, Diluted Alcohol 192; Norw. (Tinctura Opii Benzoica), Tincture of Opium 50, Benzoic Acid 5, Camphor 3, Oil of Anise 2, Diluted Alcohol 940; Mex. (Tinctura de Opio Alcanforado), Extract of Opium 3, Benzoic Acid 3, Camphor 2, Oil of Anise 3, Alcohol (60 p.c.) to 600; Port. (Tinctura de Opio Composta), Opium 1, Benzoic Acid 1, Camphor 1, Oil of Anise 1, Alcohol (65 p.c.) 196; Swiss, Tincture of Opium 10, Benzoic Acid 1, Camphor 1, Oil of Anise 1, Diluted Alcohol 187; U.S. (Tinctura Opii Camphorata), Opium 4, Benzoic Acid 4, Camphor 4, Oil of Anise 4, Glycerin 40, Diluted Alcohol to 1000. All by weight, except U.S. Swed. (Tinctura Opii Benzoica), Opium 5, Benzoic Acid 5, Camphor 3, Oil of Anise 2, Diluted Alcohol to 1000. Belg., Fr. and Swiss adopt the *Brussels Conference* standard.

Tests.—Compound Tincture of Camphor has a specific gravity of 0·915 to 0·920; contains 0·2 to 0·35 p.c. w/v of total solids; the percentage of Absolute Alcohol should be about 58·0 p.c. by volume; 100 c.c. should contain nearly 0·05 gramme of anhydrous Morphine; it should afford well-marked reactions for Benzoic and Meconic Acids, and when diluted with Water should assume an opalescent appearance.

It is frequently found deficient in Alcohol, in the requisite proportion of Tincture of Opium; the Benzoic Acid may be either of inferior quality or altogether omitted, and Oil of Anise may be absent. The specific gravity of the sample affords a fair indication of the percentage of Absolute Alcohol, and may be supplemented if necessary by an actual determination of the Alcohol by distillation. The Benzoic Acid may be determined by rendering 10 c.c. of the Tincture alkaline by the addition of Sodium Hydroxide Solution and removing the Alcohol by evaporation. The aqueous liquid may then be extracted with Ether, the ethereal solution separated, the aqueous fluid faintly acidified with Hydrochloric Acid and again shaken with Ether, the ethereal solution removed, the Ether evaporated spontaneously and the Benzoic Acid weighed, or the ethereal solution may be freed from mineral acid by carefully washing with Water and titrated with Twentieth-normal Volumetric Potassium or Sodium Hydroxide Solution. Each c.c. of Twentieth-normal Solution represents 0·00605 gramme of Benzoic Acid. The separated Benzoic Acid should possess the melting point, and should otherwise correspond to the tests given under Benzoic Acid. Meconic Acid may be detected by diluting a little of the Tincture with Alcohol (45 p.c.) until of a pale straw colour and adding a drop of Ferric Chloride Test-solution, when a deep red coloration will be produced. The quantity of Morphine present is too small to permit the employment of the *B.P.* method of determination. A process depending on the extraction of the Morphine from the evaporated Tincture by hot Amylic Alcohol is described (*Y.B.P.* '05, 461; *Analyst*, '05, 336); the extracted Morphine being subsequently recognised by Ferric Chloride Test-solution and the Nitric Acid colour test. It has been pointed out by Allen (*Analyst*, '02, 352) that cough mixtures, in addition to containing Paregoric, frequently contain Ipecacuanha in some form or other, and the alkaloids of the latter are liable to be mistaken for Morphine if colour reactions alone are relied upon. These colour reactions are given under the heading of Ipecacuanha and Psychotrine. A process for the analysis of the Tincture is recorded, and the use of hot Amylic Alcohol for the extraction of the Morphine is suggested in the paper.

Not Official.

AQUA CAMPHORÆ CONC.—Spirit of Camphor, 3 fl. drm.; Distilled Water, 40 fl. oz.—*Pharm. Form.* (*MacEwan*).

CAMPHOR BALL.—Camphor, 2; White Beeswax, 5; Spermaceti, 3; Oil of Almonds, 3; Tincture of Tolu, ¼; melt and pour into ½ oz. moulds.

The proportion of the Wax to Spermaceti varies in different forms, but the total of the two combined is generally much the same.

CAMPHORA CUM CRETA (Camphorated Chalk).—Camphor, 1; Precipitated Chalk, 8; powder the Camphor by rubbing it with a few drops of Alcohol (90 p.c.), mix in the Chalk, and pass the whole through a sieve.

This is used as a dentifrice, it is also made in the proportion 1 to 7 (*Mart.*) and 1 to 9 (*B.P.C.*).

CAMPHORATED CHLOROFORM. *See* CHLOROFORM.

CAMPHORATED QUININE.—Camphor, in powder, 8 grains; Ammoniated Tincture of Quinine, *q.s.* to make 1 fl. oz.

A very useful combination for an ordinary cold in the head. Dose.—1 to 2 fl. drm.

Camphorated Quinine Capsules.—Quinine Sulphate, 60 grains; Ammonium Carbonate (powdered finely), 100 grains; Powdered Camphor, 50 grains; Soft Paraffin and Liquid Paraffin, *q.s.* to make a thin paste and fill 100 capsules. Each capsule represents about 30 minims of Camphorated Quinine.

CERATUM CAMPHORÆ.—Camphor, 2; White Beeswax, 3; Benzoated Lard, 4; Oil of Almonds, 3: melt together and stir till cold.

U.S.P. CERATUM CAMPHORÆ is much weaker in Camphor:—Camphor Liniment, 10; White Wax, 35; White Petrolatum, 15; Benzoinated Lard, 40; it contains 1 of Camphor in 50.

Belg. (Unguentum Camphoratum), Camphor 1, Simple Ointment 4; Fr. (Pommade Camphrée), Camphor 2, Benzoinated Lard 7, White Wax 1; Mex. (Pomada Alcanforada), Camphor 1, White Wax 1, Lard 8.

B.P.C. **Unguentum Camphoræ.**—Camphor, 1; Soft Paraffin, 9.

B.P.C. **Unguentum Camphoræ Durum** (*Syn.* Camphor Ice).—Camphor, 10; Hard Paraffin, 22; Soft Paraffin, 68.

PHENOL CAMPHOR. *See* ACIDUM CARBOLICUM.

ESSENTIA CAMPHORÆ.—Camphor, 1; Alcohol (90 p.c.), 20. Given for coryza, 5 minims every hour in Water or on Sugar.

This is half the strength of the official Spiritus Camphoræ.

SPIRITUS CAMPHORÆ FORTIOR (Rubini's Essence).—A saturated solution, in Alcohol (90 p.c.), contains about 1 in 2¼.

This has been incorporated in the *B.P.C.* as **Essentia Camphoræ,** with the names Spiritus Camphoræ Fortior, and Rubini's Essence of Camphor as synonyms, as follows:—Camphor, 2; Alcohol (90 p.c.), *q.s.* to make 5.

ÆTHER SPIRITUOSUS CAMPHORATUS.—Camphor 15, Spirit of Ether 85.—*Dan.*, *Norw.* and *Swed.*

SPIRITUS CAMPHORÆ COMPOSITUS (*B.P.C.*).—Camphor, 0·25; Benzoic Acid, 0·50; Oil of Anise, 0·25; Liquid Extract of Liquorice, 1; Alcohol (60 p.c.), *q.s.* to produce 100.

SYRUPUS CAMPHORÆ COMPOSITUS.—Benzoic Acid, 3 drm.; Glacial Acetic Acid, 3 oz. 5 drm. 20 minims; Vinegar of Squill, 2 pints; Vinegar of Ipecacuanha, 40 fl. oz.; Anise Oil, 2 drm.; Camphor, 2 drm.; Tincture of Opium, 10 oz. 5 drm. 20 minims; Sugar, 28 lb.; Burnt Sugar, *q.s.*; Water, to make 4 gall. Dose.—1 drm. (= 1 minim of Tincture of Opium).—*Bristol Royal Infirmary.*

This has been incorporated in the *B.P.C.*

CAMPHOID (Martindale).—Camphor, 20; Absolute Alcohol (by weight), 20; Pyroxylin, 1. Employed as a solvent for Iodoform, the odour of which it is said to disguise.—*P.J.* '92, i. 831; *B.M.J.* '92, i. 1086.

VINUM CAMPHORATUM (*Ger.*).—Camphor, 1; Alcohol (90 p.c.), 1; Mucilage of Acacia, 3; White Wine, 45. *Swiss*, Camphor 2, Alcohol (90 p.c.) 3, Acacia 2, White Wine 93. All by weight.

ESSENTIAL OIL OF CAMPHOR.—Camphor Oil as it is distilled from Camphor Wood contains some quantity of solid Camphor which is separated by filtration and pressure, and sometimes by refrigeration. It has been used as an application in rheumatism.

Two kinds of Camphor Oil are known commercially, Japan and China Camphor Oil.

Japan Camphor Oil.—A yellow or yellowish-brown liquid possessing a strong odour of Saffrol. It has a specific gravity of 1·010 to 1·020, and an optical rotation in a 100 mm. tube of + 5·5°. It dissolves readily in Alcohol (90 p.c.).

A considerable portion of the Saffrol is frequently removed from the oil, which is then commonly known in the trade as 'White Oil of Camphor.' The abstraction of Saffrol is indicated by a decrease in the specific gravity.

China Camphor Oil.—A pale yellow or brownish-yellow liquid, possessing a strong camphoraceous odour. It has a specific gravity of 0·950 to 0·960, and an optical rotation in a 100 mm. tube of about + 30°. It dissolves readily in Alcohol (90 p.c.).

EAU SEDATIVE (Lotion Ammoniacale Camphrée, *Fr.*).—Spirit of Camphor, 10; Liquor Ammon., 60; Sodium Chloride, 60; Distilled Water, 1000. *Belg.*, Sodium Chloride 60, Liquid Ammonia 60, Spirit of Camphor 10, Water 870; *Mex.*, Sodium Chloride 60, Liquid Ammonia 60, Spirit of Camphor 10, Water 1000; *Swiss*, Sodium Chloride 60, Water 830, Spirit of Camphor 10, Liquid Ammonia 100.

CAMPHOR SALICYLATE (Camphossil).—A crystalline, unctuous, deliquescent mass. Condensation product of Camphor and Salicylic Acid. Introduced as an antiseptic and antipyretic.

Dose.—7½ grains = 0·5 gramme.

OXYCAMPHOR.—A white crystalline powder, soluble about 1 in 50 Water. Has been found useful in cases of dyspnœa, especially of pulmonary origin. Best given in cachets or gelatin capsules. It is easily altered by exposure to air.—*P.J.* '02, ii. 132.

Dose.—15 to 30 grains = 1 to 2 grammes.

Under the name of **Oxaphor,** a 50 p.c. solution of the above in Alcohol (90 p.c.) has been introduced. **Camphoroxol** is stated to be a 1 p.c. alcoholic solution of Camphor containing 3 p.c. Hydrogen Dioxide.

Thymol-Camphor and **Resorcin-Camphor** are oily fluids obtained by heating Camphor with equal parts of Thymol and Resorcin respectively.

CAMPHORIC ACID.—Colourless, crystalline leaflets, or a white, crystalline powder, with a faint camphoraceous odour.

It is a di-basic acid prepared by the oxidation of Camphor. It should be kept in well-closed vessels.

Solubility.—1 in 160 of cold Water; 1 in 8 of boiling Water; 1 in 1·5 of Alcohol (90 p.c.); readily in Ether.

Dose.—15 to 30 grains = 1 to 2 grammes, conveniently given in **cachets.**

Is a valuable remedy in cases of urinary calculi and of vesical catarrh. A 1 p.c. solution has been recommended in acute and chronic affections of the respiratory passages.—*P.J.* (3) xix. 507.

In 4 p.c. alcoholic solutions as spray or linctus, in laryngeal phthisis.

In cystitis, 15 grains 3 times a day.—*Y.B.P.* '02, 167.

One gramme 3 or 4 times a day, or 2 grammes in the evening, checks the night sweating in phthisis.—*L.M.R.* '88, 276.

Foreign Pharmacopœias.—Official in Dutch, Ger., Jap., Swiss and U.S.

Tests.—Camphoric Acid has a melting point of 186° to 187° C. (366·8° to 368·6° F.), and is dextrorotatory, a 10 p.c. alcoholic solution showing a value $[a]_D = +47{\cdot}8°$. The aqueous solution is acid in reaction towards blue Litmus paper. 1 gramme of the acid should require for neutralisation not less than 10·0 c.c. of Normal Volumetric Potassium or Sodium Hydroxide Solution, indicating not less than 99·31 p.c. of pure Camphoric Acid.

The more generally occurring impurities are Chlorides, Sulphates, Nitrates, and mineral matter. The saturated aqueous solution should not be rendered turbid by Silver Nitrate nor by Barium Chloride Solution. When a solution of Ferrous Sulphate is poured carefully on to the cold saturated aqueous solution of the acid mixed with an equal quantity of Sulphuric Acid, no dark coloration should be developed at the line of junction of the two fluids. It should leave no weighable residue after ignition.

Not Official.

CAMPHORA MONOBROMATA.

MONOBROMATED CAMPHOR.

$C_{10}H_{15}BrO$, eq. 229·33.

FR., CAMPHRE MONOBROMÉ; GER., MONOBROMKAMPHER; ITAL., CANFORA MONOBROMATA; SPAN., ALCANFOR MONOBROMADO.

Colourless, prismatic needles, or scales, with a camphoraceous odour and taste.

It is a substitution product of Camphor, the Hydrogen radicle of the latter being replaced by the halogen Bromine.

It should be kept in well-closed bottles.

Solubility.—Almost insoluble in Water; soluble 1 in 12 of Alcohol (90 p.c.); 10 in 7 of Chloroform; 1 in 2 of Ether; 1 in 8 of Olive Oil; sparingly in Glycerin.

Medicinal Properties.—Hypnotic and sedative. Given in hysteria, epilepsy, chorea, spermatorrhœa, and delirium tremens; but its use requires caution. It has been stated to be an antidote to Strychnine.

Dose.—2 to 5 grains = 0·13 to 0·32 gramme.

Prescribing Notes.—*It can be prescribed in* **pills** *with 'Diluted Glucose,' or can be dissolved in Almond or Olive Oil and emulsified with Mucilage and Water. It is also given with Extract of Belladonna.*

Larger doses than 5 grains are sometimes given in delirium tremens.

Foreign Pharmacopœias.—Official in Dutch, Fr., Ital., Jap., Mex. (Alcanfor Monobromado), Port., Span. (Alcanfor Monobromado), Swiss and U.S. Not in the others.

Tests.—Monobromated Camphor has a melting point of 76° C. (168·8° F.), and a boiling point of 274° C. (525·2° F.). It should be neutral in reaction towards Litmus paper. When boiled with Silver Nitrate Solution a precipitate of Silver Bromide is formed. It is soluble in cold concentrated Sulphuric Acid without alteration in colour and without decomposition, and is again precipitated when this solution is poured into Water. When fused with metallic Sodium in a dry test-tube and the residue dissolved in Water, the resulting solution acidified with Nitric Acid yields with Silver Nitrate Solution a copious, faintly yellowish precipitate almost insoluble in weak Ammonia Solution.

The more generally occurring impurities are Bromides, Hydrobromic Acid, and mineral residue. The presence of Bromides is readily detected by the formation of an opalescence or precipitate when treated with Silver Nitrate Solution; Hydrobromic Acid by the reaction towards blue Litmus paper. It should be completely volatilised by heat leaving no weighable residue, showing the absence of mineral matter.

CANNABIS INDICA.

INDIAN HEMP.

Fr., Chanvre Indien; Ger., Indischer Hanf; Ital., Canape Indiana; Span., Cañamo.

The dried flowering or fruiting tops of the female plant of *Cannabis sativa*, Linn.; from which, of course, the Resin has not been removed; grown in India.

O'Shaughnessy introduced Indian Hemp into this country, and Peter Squire made the extract for him.

The official variety may consist, according to the official monograph, of either the flowering or fruiting tops, and is frequently of very inferior quality, since the fruiting tops yield less Resin.

Preparations of Cannabis Indica show marked variation in physiological activity, owing to age, and perhaps other causes.

The loss of strength would appear to be due to the oxidation of the active principle. It seems desirable that Indian Hemp used in medicine should be obtained as fresh as possible, and that, as suggested by Dr. Marshall, the drug and its preparations should be preserved in hermetically-sealed packages if they are to be kept for any considerable time before use. The drug should be purchased once a year only, when the new harvest comes in. This is generally in April or May.—*P.J.* '02, i. 342, 362, 392; '02, ii. 131, 263, 284; *C.D.* '02, ii. 296; *Y.B.P.* '02, 52, 168, 401.

A description of the names which are applied to the different forms of the drug, *e.g.*, Ganja, Guaza, Bhang, Chur, Churrus or Charas, Haschish and Majun; and useful hints regarding the collection and storage of the drug.—*P.J.* '02, ii. 131.

The important constituent is a Resin (Extract of Indian Hemp); the active principle is stated to be a red Oil, **Cannabinol,** which is liable to become oxidised and inert. The ethereal extract from Charas yielded four distinct chemical substances: (1) about 1·5 p.c. of a Terpene, boiling at 160° to 180° C. (320° to 356° F.); (2) 2 p.c. of a Sesquiterpene, boiling at 258° to 259° C. (496·4° to 498·2° F.); (3) 0·15 p.c. of a Paraffin, $C_{29}H_{60}$, melting point, 63° to 64° C. (145·4° to 147·2° F.); (4) 33 p.c. of a toxic red oil, Cannabinol, $C_{18}H_{24}O_2$, boiling at 265° C. (509° F.), under a pressure of 20 mm.—*J.C.S. Trans.* '96, 539; '99, 20.

A Cannabinol prepared according to Wood, Spivey and Easterfield's process was found to be physiologically inactive, and it was therefore concluded, though apparently without sufficient reason, that it is not the active principle of Cannabis, and so far as present information extends, the active principle has not yet been isolated.—*C.D.* '02, ii. 296; *P.J.* '02, ii. 131, 171; *Y.B.P.* '02, 399.

Medicinal Properties.—Sedative, anodyne, and antispasmodic. Has been used with success in migraine and delirium, neuralgia, pain of last stages of phthisis, and in acute mania; also in menorrhagia and dysmenorrhœa. It is combined with Belladonna in whooping-cough, and in infantile convulsions, hepatic and renal colic; it is given in tetanus and hydrophobia.

Prescribing Notes.—*Usually prescribed in the form of Extract or Tincture. Dose of the Extract* ¼ *to* 1 *grain* (*with a sufficiency of Liquorice Powder to form a pill*); *but as it varies considerably in strength it is better to commence with the smaller dose; toxic symptoms have been produced with* 1 *grain. Dose of the Tincture,* 5 *to* 15 *minims, which can be taken on Sugar, or diffused in Water by the aid of* 1 *fl. drm. of Mucilage of Acacia to each fl. oz. of Water; the Mucilage should be diluted with twice its volume of Water before the addition of the Tincture.*

Two interesting cases of toxic symptoms, caused in one case by taking the whole of the active ingredient of a mixture in the last dose, owing to omission of Mucilage for suspension. The other, a nervous patient, for whom the *B.P.* minimum dose was prescribed, and who took a dose from the bottle without measuring, and inadvertently took rather more than a double dose.—*L.* '03, i. 1042.

Official Preparations.—Extractum Cannabis Indicæ. Of the **Extract,** Tinctura Cannabis Indicæ. The **Tincture** is contained in Tinctura Chloroformi et Morphinæ Composita.

Not Official.—Cannabinæ Tannas, Cannabinon, and Fluidextractum Cannabis Indicæ.

Antidotes.—In case of over-dose, after employing stomach-tube, or emetics, hot brandy-and-water may be given, vegetable acids, such as lemon juice, vinegar, and the like. Strychnine should be injected and a blister applied to the nape of the neck.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Hung., Ital., Jap., Norw. (Fructus Cannabis), Port. (Canhamo), Russ., Mex. (Marihuana), Swed., Swiss and U.S. Not in Ger.

It does not produce constipation or loss of appetite; on the contrary, it restores the appetite which has been lost by chronic Opium and Chloral drinking. —*L.* '89, i. 625.

In chorea and pertussis.—*L.* '02, i. 1159.

Descriptive Notes.—Indian hemp is imported from Bombay under the name of Guaza, in compressed or flattened masses, consisting of the flowering and fruiting tops of the plant, matted together with its resinous secretion. From Calcutta it is sometimes imported in a rolled or cylindrical form under the name of Ganja (*P.J.* (4) xv. 129; xi. p. 782) but this form, which is much more active, rarely remains in this country, being exported to the West Indies (*P.J.* (4) x. p. 522.) The best quality of either kind is seldom exported from India, since the natives are aware that it rapidly loses its activity on keeping and therefore retain the current crop for home use, exporting that of the previous year (*P.J.* (4) xiv. p. 342). The form of the drug official in the *B.P.* is the compressed form of Guaza. The upper leaves which accompany the flower are alternate and 1–3 partite, whilst the lower leaves have 5–7 linear serrate leaflets and are opposite. The bracts as well as the leaves have characteristic resin glands and one-celled curved hairs with a cystolith contained in the enlarged base of each. The bract below the fruit is ovate-lanceolate.

During the last few years compressed Cannabis Indica has been imported from Zanzibar, Delagoa Bay, and from the North of France, but according to Dr. W. E. Dixon is not nearly so active as the Indian drug (*P.J.* (4) xx. p. 550). This difference in strength is said to be due to the fact that the female plant yields less resin if male plants are present in the fields. In India the male plants are always removed before the plant flowers by experts employed for that purpose.

Tests.—Three typical samples of Ganja, collected at the proper season and imported direct from India, when examined in the author's laboratory yielded a total extract to Alcohol (90 p.c.) of 15·52, 15·77 and 16·85 p.c.; when evaporated to dryness and again dissolved in spirit the Alcohol-soluble matter amounted to 14·45, 14·75 and 16·7 p.c., leaving 1·07, 1·02 and 0·68 p.c. of insoluble brown extract. The ash of the 3 samples amounted respectively to 12·70, 12·30 and 11·90 p.c.

Preparations.

EXTRACTUM CANNABIS INDICÆ. EXTRACT OF INDIAN HEMP.

Exhaust Indian Hemp, in coarse powder, with Alcohol (90 p.c.) by percolation; evaporate to a soft extract.

Dose.—$\frac{1}{4}$ to 1 grain = 0·016 to 0·06 gramme.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Hung., Ital., Jap., Mex. (Extracto de Marihuana), Port., Russ., Swiss and U.S. Not in the others. U.S. has also **Fluidextractum Cannabis Indicæ** (1 in 1).

Commercial extracts have been shown (*P.J.* '02, i. 234, 281, 301) to vary greatly in their physical characters, and to contain a doubtful and variable amount of extractive matter insoluble in Alcohol (90 p.c.). The use of an ethereal instead of the official extract, or, better still, one made with Absolute Alcohol, is suggested. Spiritus Ætheris *B.P.* is recommended as a menstruum for preparing the Tincture.

TINCTURA CANNABIS INDICÆ. TINCTURE OF INDIAN HEMP.

Dissolve 1 of Extract of Indian Hemp in 18 of Alcohol (90 p.c.); filter if necessary, and add Alcohol (90 p.c.), *q.s.* to yield 20.

(1 in 20)

22 minims contain 1 grain of Extract.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Foreign Pharmacopœias.—Official in Jap. and Port., 1 Extract in 20; the following are from Herb: Hung., Ital. and Mex., 1 in 5; Russ. and Swiss, 1 in 10; all by weight; U.S., 1 in 10. Not in the others.

Tests.—Tincture of Cannabis Indica has a specific gravity of 0·845 to 0·850; it contains about 4 p.c. w/v of total solids and about 87 p.c. w/v of Absolute Alcohol.

Not Official.

FLUIDEXTRACTUM CANNABIS INDICÆ (*U.S.*).—10 of Cannabis Indica, in No. 30 powder, exhausted by percolation with Alcohol (94·9 p.c.), reserving the first 9, evaporating the remainder (not above 50° C.) to a soft extract which dissolve in reserved portion, and add Alcohol (94·9 p.c.) *q.s.* to make 10.

CANNABINÆ TANNAS.—An amorphous, yellowish powder, sparingly soluble in Water, Alcohol, and Ether. Soluble in acidulated Alcohol.

Dose.—4 to 8 grains = 0·26 to 0·52 gramme, mixed with Sugar and taken as a powder or in a **cachet.**

Was introduced as a hypnotic, but its effects are very uncertain.—*T.G.* '85, 329, 379.

It is occasionally prescribed for menorrhagia.

CANNABINON.—A soft resinous substance, generally found as a 10 p.c. trituration with Milk Sugar, also introduced as a hypnotic, but the dose (1½ grains) was followed by excitement, collapse, and cramps.—*T.G.* '85, 286; *L.M.R.* '86 434; contra-indicated in cardiac disease.—*L.* '87, i. 542.

Dose.—¼ to 1 grain = 0·016 to 0·06 gramme.

CANTHARIS.

CANTHARIDES.

FR., CANTHARIDE; GER., SPANISCHE FLIEGEN; ITAL., CANTARIDE;
SPAN., CANTARIDA.

The dried Beetle, *Cantharis vesicatoria*, Latr.

It is collected in Spain, France, Russia, Sicily, and Hungary.

The powder should be dry and kept closely corked, for if at all damp it is apt to acquire a putrid odour. A piece of Camphor kept in it prevents mites.

Mylabris.—The dried beetle, *Mylabris phalerata*, is official in the *Ind.* and *Col. Add.* for India and the African and Eastern Colonies; other species of *Mylabris* may be used provided they yield an equal amount of Cantharidin.

Medicinal Properties.—Externally its effects are rubefacient and irritant; by continued application it is vesicant. For the latter purpose the Emplastrum or Liquor Epispasticus is used, and is especially effective in inflammation of deep-seated parts, as in pleuritis, pericarditis, pneumonia, sciatica, neuralgia, and over the præcordial region in acute rheumatism; applied to rheumatic joints it removes pain and swelling; applied over the epigastrium it often checks obstinate vomiting and gastric pain. It acts for a longer period, and is less irritating to the patient, than Ammoniacal or Acetic Acid embrocations. It ought not to be applied to a paralysed limb. Internally in small doses it is diuretic and aphrodisiac. It is given in gleet, in impotence, and incontinence of urine due to paralysis, but it should be given cautiously, for it irritates the kidneys and sometimes produces strangury, and it should never be given to aged people or to children, or in cases of nephritis.

Continuous counter-irritation of the spine by blisters in the neighbourhood of the cervical and lumbar enlargements the most successful treatment of rheumatoid arthritis.—*L.* '07, ii. 895.

The Tincture in 5-minim doses three times daily in Water arrests hæmorrhage from the kidney.—*B.M.J.* '98, ii. 1551.

It is the basis of most of the applications used to increase the growth of hair.

In chronic inflammation of the bladder it should *not* be used as a counter-irritant, on account of its irritating effects on the urinary organs, when absorbed. In such cases a solution of Silver Nitrate (½ drm. to 1 fl. oz. of Water) is to be preferred.

Thirty-two cases out of 56 of cystitis cured by teaspoonful doses of the following solution: Cantharidin, 1 milligramme, dissolved in 1 gramme of Alcohol, and diluted to 100 grammes with Water.—*B.M.J.E.* '95, ii. 6.

Ph. Ger. maximum single dose, 0·05 gramme; maximum daily dose, 0·15 gramme.

Official Preparations.—Acetum Cantharidis, Emplastrum Calefaciens, Emplastrum Cantharidis, Liquor Epispasticus, Tinctura Cantharidis, and Unguentum Cantharidis. Collodium Vesicans is prepared from Liquor Epispasticus.

Not Official.—Cantharidin, Potassium Cantharidate, Charta Epispastica, Emplastrum Vesicans, Linimentum Crinale, Liquor Cantharidis Concentratus, Unguentum Stimulans, and Boni's Blister.

Antidotes.—Emetics or stomach-tube, followed by Barley Water, Gruel, white of Egg; inject Morphine for pain.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Descriptive Notes.—The dried beetle, *Cantharis vesicatoria*, Latr., has shining coppery green, or green coloured wing cases, and is of an oblong shape, 18 to 25 mm. long (1·5 to 3 cm., and 6 to 8 mm. broad, *P.G.*), and has an unpleasant odour. The insects or powder should be dried when received into stock (preferably in the presence of quicklime) at a temperature not exceeding 40° C. and kept from access of air in a stoppered bottle, the glass stopper being smeared with Vaseline, or they will be destroyed by mites and undergo partial decomposition. The *Mylabris phalerata*, Pall., which is given in the *Ind.* and *Col. Add.* as a permissible substitute for Cantharis in India and the African and Eastern Colonies, has elytra or wing cases, which are black with two wavy or orange-brown transverse bands, and a large spot of the same colour at the base of each elytron. It is oblong, 25 mm. or more in length and 9 mm. in breadth. Other species containing 'the same percentage' of Cantharidin as *M. phalerata* (amount not stated) may be also employed for official preparations in those countries. Under the name of Chinese Cantharides it is occasionally found in English commerce, mixed largely with the smaller species, *Mylabris Cichorii*, Fabr., these insects forming a cheap source of Cantharidin, but the *M. Cichorii* contains less than *M. phalerata*. *M. bifasciata*, Oliv., a Cape of Good Hope insect yields about 1 p.c. of Cantharidin. The new crop of Cantharides can be purchased in early autumn. The *U.S.P.* requires that Cantharides should be thoroughly dried at a temperature not exceeding 40° C. (104° F.) and that the powder should contain few or no hairs; but the insect itself is hairy. The microscopical characters of powdered Cantharides are given in *P.J.* (4) xxv. p. 185.

Tests.—Numerous processes have been devised for the determination of Cantharidin. That adopted by the *P.G.* is essentially as follows:—A weighed quantity of 25 grammes of the powdered Cantharides is treated with 100 grammes of Chloroform and 2 c.c. of Hydrochloric Acid; the mixture is allowed to stand for 24 hours with occasional agitation, and 52 grammes of the Chloroform solution is filtered off through a dry, closely-covered filter. The Chloroform is distilled off and the residue is treated with 5 c.c. of Petroleum Ether; allowed to stand for 12 hours with occasional shaking, the liquid filtered through a 5 cm. filter paper, which has previously been weighed after extraction with Petroleum Ether; the residue is washed on to the filter with 10 c.c. of Petroleum Ether without endeavouring to detach the crystalline residue adhering to the flask. Both the flask and the filter are washed with Water containing a drop or two of Ammonium Carbonate Solution (1 of Ammonium Carbonate in 3 by weight of Water and 1 part by weight of Ammonia Solution) till the washings are colourless; then washed with 5 c.c. of Water dried and weighed. The crystalline residue should amount at least to 0·1 gramme corresponding to 0·8 p.c. w/w of Cantharidin.

This standard is considered (*P.J.* '01, ii. 715) to be too high; the average yield of commercial Spanish flies is nearer 0·6 p.c.

Mylabris Cichorii is richer in Cantharidin than Cantharides, and the use of these flies as a source of the vesicant has therefore been suggested. The employment of Cantharidin in place of Cantharides for the production of the galenical preparations has been advocated in several quarters. If this view were supported by clinical evidence it would obviate the difficulties encountered by the variations of commercial samples, and would enable other species of Cantharis possibly containing a larger percentage of the active principle to be utilised. The new Belgian Pharmacopœia employs Cantharidin for the preparation of an ointment.

The ash of Cantharides should not exceed 8·0 p.c.

Preparations.

ACETUM CANTHARIDIS. VINEGAR OF CANTHARIDES.

Cantharides, bruised, 2; Glacial Acetic Acid and Distilled Water, mixed in equal volumes, *q.s.* to yield 20; by maceration for 24 hours and subsequent percolation. (1 in 10)

A corresponding preparation, **Acetum Mylabridis,** is official in the *Ind.* and *Col. Add.* for India and the African and Eastern Colonies.

It has been suggested (*P.J.* '98, i. 259; *C.D.* '98, i. 422) to replace Cantharides by Cantharidin, dissolving 1 of Cantharidin in 200 of Glacial Acetic Acid and adding Acetic Acid *q.s.* to yield 2000. This formula has been incorporated in *B.P.C.* under the title **Acetum Cantharidini.**

Foreign Pharmacopœias.—Official in Port., about 1 in 6; Dutch (Acetum Mylabridis), 1 in 10. Not in the others.

Tests.—Vinegar of Cantharides has a specific gravity of 1·064 to 1·070, should contain not less than 2·5 p.c. w/v of total solids, and 1 c.c. should require for neutralisation not less than 8 c.c. of Normal Volumetric Potassium or Sodium Hydroxide Solution, indicating not less than 47·66 p.c. w/v of absolute Acetic Acid.

COLLODIUM VESICANS. Blistering Collodion.

Blistering Liquid, 20; Pyroxylin, $\frac{1}{2}$; dissolve by agitation in a well-closed vessel.

U.S. is made with Flexible Collodion.

See also Cantharidin, below.

Foreign Pharmacopœias.—Official in Dan., Ger., Jap., Mex. (Collodion Cantaridado), Norw., Port., Russ., Swiss and U.S. Not in the others.

EMPLASTRUM CALEFACIENS. *B.P.Syn.*—Warming Plaster.

Infuse 1 of Cantharides, in coarse powder, in 5 of boiling Distilled Water; strain and evaporate to $1\frac{3}{4}$ on a water-bath; add Yellow Beeswax, 1; Resin, 1; Resin Plaster, 13; Soap Plaster, 8. (about 1 in 25)

A corresponding preparation, **Emplastrum Calefaciens Mylabridis,** is official in the *Ind.* and *Col. Add.* for India and the African and Eastern Colonies.

EMPLASTRUM CANTHARIDIS. Cantharides Plaster.

Cantharides, in powder, 7; Yellow Beeswax, 4; Lard, 4; Resin, 4; Soap Plaster, 1. (nearly 1 in 3)

Melt the Resin first, and add to it the plaster, Wax, and Lard; when all are completely fluid add the Cantharides gradually with stirring, continuing the same until cold.

A corresponding preparation, **Emplastrum Mylabridis,** is official in the *Ind.* and *Col. Add.* for India and the African and Eastern Colonies.

It has been suggested (*P.J.* '98, i. 259; *C.D.* '98, i. 422) to replace Cantharides by Cantharidin, dissolving 1 of Cantharidin in Chloroform *q.s.* and stirring it with 999 of a mixture in equal parts of Yellow Wax, Prepared Suet, and Resin. The solution is stirred into the melted mixture and the Chloroform should be dissipated in the formation of the plaster. This formula has been incorporated in *B.P.C.* under the title **Emplastrum Cantharidini.**

Foreign Pharmacopœias.—Official in Belg., Dutch, Fr., Hung., Ital., Mex., Span. and Swed., about 1 in 3; Austr., Dan., Ger., Jap., Norw., Port., Russ. and Swiss, about 1 in 4. Not in U.S.

Emplastrum Cantharidum Perpetuum, Swiss, 3 in 10; Dan., Nor. and Swed. (Emp. Canth. cum Euphorbio), about 1 in 7; Hung., 1 in $5\frac{1}{2}$; Ital. (Empiastro de Cantaride mite), 1 in 21; Austr., Ger. and Russ., 1 in 10. Not in the others. Norw. includes an Emplastrum Cantharidis Colatum; Ger. includes an Emplastrum Cantharidum pro usu veterinario, about 1 in 5.

LIQUOR EPISPASTICUS. Blistering Liquid.

10 of Cantharides, percolated with Acetic Ether to produce 20 of Liquor. (1 in 2)

A corresponding preparation, **Liquor Epispasticus Mylabridis,** is official in the *Ind.* and *Col. Add.* for India and the African and Eastern Colonies.

Span. has Tintura Cloroformica de Cantaridas, White Wax, 1; Cantharides, 100; Chloroform, *q.s.* to make 100. By weight.

See also Cantharidin, below.

TINCTURA CANTHARIDIS. Tincture of Cantharides.

Macerate 1 of Cantharides, in No. 40 powder, with 80 of Alcohol (90 p.c.). (1 in 80)

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.; if frequently repeated, 2 to 5 minims = 0·12 to 0·3 c.c.

Ger. and U.S. are much stronger.

Ph. Ger. maximum single dose, 0·5 gramme; maximum daily dose, 1·5 grammes.

It has been suggested (*P.J.* '98, i. 259; *C.D.* '98, i. 422) to replace Cantharides by Cantharidin, dissolving 1 of Cantharidin in 100 of Chloroform and adding Alcohol (90 p.c.) *q.s.* to yield 10,000.

This formula has been incorporated in *B.P.C.* with an increase of the Chloroform to 125, under the title **Tinctura Cantharidini.**

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Fr., Ger., Ital., Jap., Port., Russ., Span., Swed., Swiss and U.S., 1 in 10; Mex., 1 and 10; Hung., 1 and 5. All by weight except U.S.

The *Brussels Conference* adopted a strength of 10 p.c. for the Tincture, employing Alcohol (70 p.c.).

Tests.—Tincture of Cantharides has a specific gravity of about 0·835; it contains about 0·25 p.c. w/v of total solids and about 90 p.c. w/v of Absolute Alcohol.

UNGUENTUM CANTHARIDIS. CANTHARIDES OINTMENT.

Cantharides, bruised, 1; Benzoated Lard, 10: digest at 120° F. (48·9° C.) for 12 hours and strain through calico, using gentle pressure towards the end. (about 1 in 10)

Employed to promote discharge from a blistered surface. Being very painful this is seldom practised.

A corresponding preparation, **Unguentum Mylabridis,** is official in the *Ind.* and *Col. Add.* for India and the African and Eastern Colonies.

It has been suggested (*P.J.* '98, i. 259; *C.D.* '98, i. 422) to replace Cantharides by Cantharidin, dissolving 1 of Cantharidin in Chloroform *q.s.*, and stirring it into a mixture of 499 of Yellow Beeswax and 2500 Olive Oil (by weight) previously melted. The Chloroform should be dissipated in the formation of the Ointment.

This formula has been incorporated in *B.P.C.* under the title **Unguentum Cantharidini,** in which the proportions are given as 0·0325, 16, and 84.

Foreign Pharmacopœias.—Official in Fr. (Pommade Epispastique Verte), about 1 in 33, and P. E. Jaune, 1 in 17¾; Ger. and Jap., Oil of Cantharides 3, Yellow Wax 2; Port., about 1 in 23; Ital. (Pomata di Cantaridi), 1 in 10; Swed., 1 in 5 (fort., 1 in 4); Span., 3 in 10; Swiss, Cantharidine, 1 in 250; U.S. (Ceratum Cantharidis), 32 in 100; Mex. (Ungueuto de Canteridas), about 1 in 18. Not in Austr., Dutch or Hung. Ger. and Swiss have Unguentum Cantharidum pro usu veterinario (1 in 5); Belg. (Unguentum Cantharidini, Cantharidin), 1 in 2000; (Unguentum Cantharidis cum Euphorbio), Cantharides, 1 in 5.

Ger. and Jap. have Oleum Cantharidatum; Mex. has Aceite de Cantaridas.

Not Official.

CANTHARIDIN. $C_{10}H_{12}O_4$, eq. 194·62.—White, inodorous, crystalline scales.

Solubility.—1 in 1150 of Rectified Spirit; 1 in 700 of Rectified Ether, sp. gr. 0·720; 1 in 55 of Chloroform; 1 in 150 of Acetic Ether, but even when dissolved at 60° F. part separates on standing; 1 in 200 of Almond Oil; 1 in 65 of Oil of Cloves.

Acetone is the best solvent for Cantharidin, which it dissolves 1 in 40, and as it is cheaper it possesses a double advantage over Acetic Ether. Acetone makes a good Liquor Epispasticus; it also dissolves Pyroxylin, and is therefore suitable for making Collodium Vesicans. Acting upon this suggestion *B.P.C.* have included a **Collodium Cantharidini:**—Cantharidin, 0·35 gramme; Acetone Collodion, *q.s.* to make 100 c.c., but in the *B.P.C. Supplement* the Cantharidin is first dissolved in 30 c.c. of Acetone, then Acetone Collodion added to make up 100 c.c.

Foreign Pharmacopœias.—Official in Belg., Fr., Mex., Port., Span. and Swiss.

Tests.—Cantharidin melts at 218° C. (424·4° F.), and when heated further sublimes in white needles. The aqueous solution is neutral towards Litmus paper. Solutions of Cantharidin possess powerful vesicating properties; it dissolves without change of colour in concentrated Sulphuric Acid, and again separates when diluted with Water. It leaves no residue upon ignition.

POTASSIUM CANTHARIDATE.—Colourless, needle-shaped crystals; soluble in Water; insoluble in Ether and in Chloroform. Should be preserved in well-stoppered bottles.

Liebreich's Solution contains 0·2 gramme Cantharidin and 0·4 gramme Potassium Hydroxide in 1000 c.c. of sterilised Water; 1 c.c. contains 0·0002 gramme Cantharidin in the form of Potassium Cantharidate. **Dose.**—0·5 c.c.; given hypodermically, also internally in diseases of tubercular origin, in lupus and in syphilis; has since been replaced by a tincture made with Cantharidin, 1, in Tincture of Orange Peel, 5000. **Dose.**—0·5 c.c., and never more than 0·75 c.c., mixed with liqueur-glassful of Water.—*B.M.J.* '02, ii. 1231; *P.J.* '02, ii. 708.

Official in Fr., Mex. and Span.

CHARTA EPISPASTICA (*B.P.* 1885).—Powdered Cantharides, 4; White Wax, 16; Spermaceti, 6; Olive Oil, 8; Resin, 3; Canada Balsam, 1; Distilled Water, 24. Conveniently spread on paper ruled in divisions of 1 square inch.

Fr. has Sparadrap Vesicant and Sparadrap de Cantharidate de Potassium.

EMPLASTRUM VESICANS.—Cantharidin, 1; Chloroform, a sufficiency; Yellow Beeswax and Wool Fat, in equal proportions, 499 parts. The Chloroform is used to dissolve the Cantharidin, and is afterwards dissipated on a water-bath. —*University.*

LINIMENTUM CRINALE.—Cantharidin, 1 grain; Acetic Ether, 6 fl. drm.; dissolve and add Alcohol (90 p.c.), 6 fl. oz.; Castor Oil, 2 fl. oz.; Oil of Lavender, 15 minims.

This Liniment is highly recommended for application to the head where the hair is falling off; but after applying it a few times the head should be washed or the Cantharidin may accumulate, and cause too much irritation. It may be diluted with equal parts (or more) of Alcohol (90 p.c.) for delicate skins.

LIQUOR CANTHARIDIS CONCENTRATUS.—1 fl. oz. = 1 oz. of Cantharides. It is obtained by repercolation with Acetic Ether, and is standardised to contain 0·5 p.c. of Cantharidin. This Liquor forms a convenient substitute for Cantharides in making the various preparations; it effects a great saving of time and produces a better result.

Acetone is better as a solvent, but cannot at present be employed for official preparations.

UNGUENTUM STIMULANS (Erasmus Wilson's).—Cantharides, in Powder, 3; Lard, 12; macerate with a moderate heat for twenty-four hours, and filter through paper.

In place of the Cantharides, 6 of Liquor Epispasticus or 3 of Liquor Cantharidis Concentratus may be employed, evaporated to a thin extract, and mixed with the melted Lard.

BONI'S BLISTER.—Camphor, 20; Chloral Hydrate, 30; melt and add powdered Cantharides, 10; digest for an hour at 150° F.; filter.

CAOUTCHOUC.

INDIA-RUBBER.

FR., CAOUTCHOUC; GER., KAUTSCHUK; ITAL., CAUCCIÙ; SPAN., CAUCHO.

The prepared milk-juice of *Hevea brasiliensis*, and various other species. The best commercial variety is known as Para rubber.

Official Preparation.—Liquor Caoutchouc. The **Liquor** is used in the preparation of Charta Sinapis.

Foreign Pharmacopœias.—Fr., Ger., Jap., Mex., Span., Swiss and U.S. (Elastica). Not in the others.

Descriptive Notes.—In Brazil Para rubber is obtained from *Hevea brasiliensis*, Muell. Arg., and other species, but in Ceylon from *Hevea brasiliensis* only.

The *B.P.* statement that it is brownish-black externally and mottled with a pale tint internally, except that mottling scarcely describes the gradual paling from the surface to the centre, applies also to Ceylon or biscuit Para rubber; this is now imported and is a remarkably pure product, though deficient in the antiseptic bodies and empyreumatic odour derived from the smoke of burnt Palm nuts that characterises the Brazilian Para rubber. Caoutchouc is easily cut with a knife if first wetted with Water.

Tests.—Caoutchouc melts at about 125° C. (257° F.), which figure is given in both *U.S.P.* and the *B.P.*, the *P.G.* gives 120° C. (248° F.). When melted it forms a fluid or semi-fluid mass, which on strongly cooling again becomes solid and still maintains its stickiness. It is insoluble in Water, Alcohol (90 p.c.) and in dilute solutions of the alkali Hydroxides. It dissolves in Benzol, Carbon Bisulphide, Chloroform, Petroleum, Ether and Oil of Turpentine. This statement must not be taken to mean that the rubber is entirely soluble in these liquids, but when treated with them it swells up and becomes gelatinous and soft, a portion being left in a disintegrated condition. This behaviour would suggest that rubber consists of constituent parts, one constituent part of which dissolves leaving the less soluble part in an insoluble but disintegrated condition.

Preparation.

LIQUOR CAOUTCHOUC. Solution of India-rubber.
India-rubber, 1; Benzol, 10; Carbon Bisulphide, 10.

CAPSICI FRUCTUS.

CAPSICUM.

Fr., Poivre de Guinée; Ger., Spanischer Pfeffer; Ital., Peperone; Span., Pimiento de Indias.

The dried ripe Fruit of *Capsicum minimum*.

Imported from Zanzibar, Sierra Leone, etc., and distinguished in commerce as Guinea Pepper, Chillies, or Bird Pepper. That from Nepaul has the finest flavour, and the powdered fruit is often preferred to the ordinary Cayenne Pepper.

It yields its virtues to Water, Alcohol, Ether, Acetic Ether, and the fixed and volatile Oils.

Medicinal Properties.—Stomachic and carminative, used chiefly as a condiment. Given in dyspepsia and flatulent distension, and to promote appetite in alcoholism. Used externally as a rubefacient, and counter-irritant in rheumatism and lumbago and for chilblains.

Dose.—$\frac{1}{6}$ to 1 grain = 0·01 to 0·06 gramme in pill.

Tinct. Capsici, 1½ drm. (increased); Tinct. Aurant., 4 drm.; Syr. Aurant., 4 drm.; Quinine Hydrochloride, 6 grains, Water, to 6 oz. Take a tablespoonful as required, three to four times a day, in dipsomania.

Official Preparations.—Tinctura Capsici, and Unguentum Capsici. The **Tincture** is contained in Tinctura Chloroformi et Morphinæ Composita.

Not Official.—Emplastrum Capsici, Extractum Capsici Liquidum, Gossypium Capsici, Linimentum Capsici, Liquor Capsici Compositus, Oleo-resinæ Capsici, Tinctura Capsici Ætherea, Tinctura Capsici Fortior, Unguentum Oleoresinæ Capsici, and Capsicum with Wool Fat.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Ger., Jap., Mex. (Chile), Port. (Pimentao), Russ., Swed., Swiss and U.S. Not in the others.

Descriptive Notes.—The fruits of *Capsicum minimum*, Roxb., which are officially called Capsicum, are known in commerce as Chillies or Bird Pepper; they vary considerably in pungency and colour. Those of Sierra Leone are usually yellowish-red, without pedicel or calyx, and are the most pungent of all. Those from Zanzibar are redder and usually have the stalk and calyx attached, and are somewhat less pungent. The Japanese are bright red, much less pungent, and the larger variety exceeds the dimensions given in the *B.P.* Like all ordinary Capsicum fruits the pericarp is glabrous, translucent and coriaceous; the seeds are flat and 10 to 20 in number. The official description limits it to those having the following characters:—Colour, dull orange-red; shape, oblong-conical and obtuse; size, ½ to ¾ in. (12 to 20 mm.) long, and ¼ in. (6 mm.) in diameter; the calyx and slender peduncle may be present or not. The bright red Cayenne Pepper of commerce is usually prepared from Natal or Egyptian varieties of *Capsicum annuum*, L., which are eight or nine times as large as the fruit of *Capsicum minimum*. Nepaul Cayenne Pepper is usually of yellowish-brown tint, and has an odour of Violets, and is prepared from the yellowish-red fruit of the Nepaul variety of *Capsicum annuum*. The bright red Bird Pepper that is given to canaries, and has hardly any pungency, is prepared from the fruit of *Capsicum annuum* var. *grossum*, Sendtn., grown in Spain, and known there as 'Pimento' or from the fruit of *Capsicum tetragonum*, Miller, grown in Hungary, and known there as 'Paprika.' In both countries the fresh fruit is used as a condiment with food. Coconada Capsicums are stated to be the produce of *Capsicum annuum*, L., var. *abbreviatum*, Fingerh., and Natal and Indian Capsicums of the var. *acuminatum*, Fingerh. The bright red Cayenne Pepper of commerce is largely made from the variety imported from Natal. J. E. Wallis has shown that the powder of *Capsicum minimum*, *Capsicum annuum*, and Japanese Chillies can be distinguished under the microscope, and suggests that the following description should be included in the Pharmacopœia as a means of excluding substitutes for, or admixtures with, the official Capsicum:—'The pericarp shows an epidermis of thick and straight-walled rectangular cells which have few pits, are often arranged in groups of 5 or 7 in a row and have an evenly striated cuticle.' (*See Pharm. Jour.* (4) xiii. p. 552; xv. p. 3.) The *U.S.P.* requires that the powdered Capsicum contains few or no starch grains or sclerenchymatous fibres, and refers the fruit to *Capsicum* *fastigiatum*, Blume. The large fruits of *Capsicum annuum*, 5 to 10 cm. long, and 4 cm. at the base, are official in the *P.G.* According to Gerrard, Alcohol (90 p.c.) is the best and most perfect solvent of the active principle of Capsicum (*Y.B.P.* '05, 453; *P.J.* (4) xxi. p. 153). The pungent principle is most abundant in the placenta which yields 0·9 p.c., the rest of the fruit yielding only 0·2 p.c. The powder of Capsicums soon becomes mouldy, if not kept dry.

Tests.—Capsicum leaves about 6·0 p.c. of ash, which figure should not be exceeded.

Preparations.

TINCTURA CAPSICI. Tincture of Capsicum.

Macerate 1 of Capsicum, in No. 20 powder, with 20 of Alcohol (70 p.c.). (1 in 20)

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Foreign Pharmacopœias.—Official in Belg., 1 and 10; Mex., 1 in 5; Dan. and Dutch, 1 and 10; Ger., Jap., Russ., Swed. and Swiss, 1 in 10; all by weight. U.S., 1 in 10. Not in the others.

Tests.—Tincture of Capsicum has a specific gravity of about 0·895; contains from 0·7 to 1·5 p.c. w/v of total solids and about 70 p.c. w/v of Absolute Alcohol.

UNGUENTUM CAPSICI. Capsicum Ointment.

Bruised Capsicum, 120 grains; Spermaceti, 60 grains; Olive Oil (by weight), 1 oz.; strain after digestion on a water-bath for one hour.

It has been suggested to use half the quantity of Liquid Extract of Capsicum (2 in 1) in place of Capsicum.

Not in the Foreign Pharmacopœias.

Not Official.

CAPSICUM WITH WOOL FAT.—1 of Liquid Extract of Capsicum (2 in 1), incorporated with 9 of Hydrous Wool Fat. This was suggested by Gerrard as an improvement on the ointment.

EMPLASTRUM CAPSICI (*Gerrard*).—Liquid Extract of Capsicum (2 in 1), 10; Resin Plaster, 95; evaporate the Alcohol and mix the residue with the plaster. This formula closely resembles that incorporated in *B.P.C.*

EMPLASTRUM CAPSICI (*U.S.*).—Apply a thin coating of Oleo-resin of Capsicum, by means of a brush, so as to form a thin coating over an area 15 centimetres square, leaving a margin round the sides.

EXTRACTUM CAPSICI LIQUIDUM (*Gerrard*).—Exhaust 100 of Capsicum Fruit in No. 60 powder with Alcohol (90 p.c.); distil off the Alcohol until the needed extract weighs 50. This has been incorporated in *B.P.C.* Fluidextractum Capsici (*U.S.P.*) is half this strength.

GOSSYPIUM CAPSICI.—Gerrard's form is to saturate evenly 9 of Cotton-Wool under pressure, with a mixture of 2 of Liquid Extract of Capsicum (2 in 1) and 7 of Alcohol (90 p.c.), and then dry. It is coloured with Eosin to keep the colour more uniform. *B.P.C.* formula is just half the strength of this.

LINIMENTUM CAPSICI.—Stronger Tincture of Capsicum, 35 c.c.; Oleic Acid, 12·5 c.c.; Oil of Lavender, 0·625 c.c.; Alcohol, *q.s.* to make 100 c.c. This preparation corresponds to Linimentum Capsici, *B.P.C.*, and to the Liniment recommended in Martindale, 1906.

LIQUOR CAPSICI COMPOSITUS (*Austr.*) Linimentum Capsici Compositum.—Powdered black Pepper and powdered Capsicum fruit, of each, 100; Potash Soap and Camphor, of each, 25; Alcohol (90 p.c.), 800; digest for eight days, express and add Oil of Rosemary and Eugenol, of each, 5; Cinnamic Aldehyde, 1; Ammonia (10 p.c.), 200.

Linimentum Capsici Compositum (*B.P.C.*). *Syn.* LIQUOR CAPSICI COMPOSITUS.—Corresponds very closely with the formula previously given in *Pocket Companion*, Liquor Capsici Compositus of *Austr. Add.* 1900, but not with *Austr. Pharm.* 1906, which is given above.

OLEO-RESINA CAPSICI. *Syn.* CAPSICIN.—The *U.S.P.* percolates Capsicum in No. 40 powder with Acetone, distilling off the Acetone, and straining out the fatty matter which separates, but Gerrard stated (*Y.B.P.* '05, 453) that Alcohol (90 p.c.) is a better solvent. The *B.P.C.* (1907) incorporated the *U.S.P.* process, but in the *B.P.C. Supplement* (1908) it has been amended as suggested by Gerrard. It is a thick liquid of a yellowish-red colour, which becomes very fluid when gently heated, and at a high temperature volatilises. Half a grain only, thus volatilised in a large room, will cause all who respire the air of the room to cough and sneeze. It is soluble in Alcohol, Ether, and Oil of Turpentine.

Dose.—⅛ to ½ minim = 0·007 to 0·03 c.c.

Foreign Pharmacopœias.—Official in U.S.

The active principle of Capsicum has been obtained by Thresh in well-defined, pearly white crystals, to which he has given the name **Capsaicin.**

TINCTURA CAPSICI ÆTHEREA.—Substitute Pure Ether for the Alcohol (90 p.c.), of Tinctura Capsici.—*L.* '90, i. 1066.

TINCTURA CAPSICI FORTIOR (Turnbull's Tincture of Capsicum).—Capsicum, in No. 40 powder, 10; percolated with Alcohol (90 p.c.), *q.s.* to yield 30.—*B.P.C. Formulary* 1901.

This corresponds with Stronger Tincture of Capsicum, *B.P.C.*

Used externally for swollen chilblains as a counter-irritant, but *not* when the skin is *broken.* For **chilblains,** saturate a piece of sponge or flannel with the Tincture, and rub the chilblain well until a strong tingling is produced; continue daily until recovery. A small dossil of Lint or Cotton, dipped into the Tincture, is an excellent remedy for toothache.

Used by aurists to paint behind the ears as a counter-irritant.

Dose.—1 to 3 minims = 0·06 to 0·18 c.c., but principally used externally.

UNGUENTUM OLEO-RESINÆ CAPSICI.—Oleo-resin of Capsicum, 2; Yellow Wax, 1; Benzoated Lard, 8.—*B.P.C. Formulary* 1901.

This corresponds to Unguentum Oleo-resina Capsici, *B.P.C.*

Not Official.

CARBO ANIMALIS.

ANIMAL CHARCOAL. BONE BLACK.

This substance and the purified Animal Charcoal are now deleted from *B.P.* They are used in pharmacy chiefly as decolorising and deodorising agents.

Foreign Pharmacopœias.—Official in Fr., Jap., Mex., Port. and U.S.

CARBO LIGNI.

WOOD CHARCOAL.

FR., CHARBON VÉGÉTAL OFFICINAL; GER., HOLZKOHLE; ITAL., CARBONE VEGETALE; SPAN., CARBON VEGETAL MEDICINAL.

A smooth, black, odourless, tasteless powder prepared by exposing wood to a red heat without access of air.

Oak, Beech, Hazel, Willow, and Poplar are employed.

Medicinal Properties.—Antiseptic, absorbent and deodoriser. Given in cases of distension by intestinal gas, and in foul eructations and diarrhœa in dysentery and typhoid; also in dyspepsia attended with flatus, acidity and pain. It will absorb and neutralise poisonous alkaloids. Externally, as a poultice, it cleanses and absorbs the fetor of ulcers and gangrenous parts.

Dose.—60 to 120 grains = 3·9 to 7·7 grammes.

Prescribing Notes.—*It has been given in powder diffused in Water, also in the form of* **capsules, cachets,** *and* **biscuits.** *The most palatable way is to mix it with* **chocolate.**

Foreign Pharmacopœias.—Official in all except Dan., Jap., Norw. and Swed.; Mex. (Carbón Vegetal).

Tests.—It should, according to the official requirements, leave 7·5 p.c. of ash when burned at a high temperature with free access of air; the *P.G.* permits only an insignificant amount of ash, and that it should burn without flame. The *U.S.P.* includes a test with Potassium Hydroxide Solution which ensures evidence of complete carbonisation.

Potassium Hydroxide.—If 1 gramme be boiled with a mixture of 3 c.c. of Potassium Hydroxide T.S. and 5 c.c. of Water for several minutes, the filtrate should be colourless or nearly so, *U.S.P.*

CARBONIS BISULPHIDUM.

CARBON BISULPHIDE.

B.P.Syn.—CARBON DISULPHIDE.

CS_2, eq. 75·55.

A colourless, very volatile, highly refractive, limpid liquid, having an ethereal and not unpleasant odour when quite pure, but usually possessing a very disagreeable odour due to impurity.

Should be preserved in well-stoppered dark amber-tinted glass bottles, partially filled, or in tin cans, in a cool atmosphere and away from naked flames, and not exposed to light.

It is produced by heating Charcoal and Sulphur together at a high temperature, the crude product being condensed and subsequently rectified.

Solubility.—About 1 in 500 of Water, readily soluble in Absolute Alcohol, Ether (sp. gr. 0·720), Chloroform, and the fixed and volatile Oils.

It is a good solvent for Iodine, Phosphorus, Precipitated Sulphur, etc.

Medicinal Properties.—It is official as a solvent for India-rubber and Phosphorus. It is a powerful poison, and is not often given internally.

1 or 2 oz. daily of a saturated Solution in Peppermint Water have been given as a substitute for Bergeon's treatment of phthisis.—*B.M.J.* '88, i. 421.

A claim has been made that this should not remain in obscurity, but retain its place as a valuable remedy in tuberculosis.—*B.M.J.E.* '04, ii. 72.

Internally in pneumonia, in 5 p.c. aqueous solution hourly. *B.M.J.E.* '06, ii. 68.

Official Preparations.—Used in the preparation of Liquor Caoutchouc and Pilula Phosphori.

Foreign Pharmacopœias.—Official in Belg., Fr., Port., Span. and U.S. Not in the others.

Tests.—Carbon Bisulphide has a specific gravity of about 1·268, *U.S.P.* gives 1·256 to 1·257 at 25° C. (77° F.); and a boiling point of about 46° C. (114·8° F.); the *B.P.* and *U.S.P.* give 46° to 47° C. (114·8° to 116·6° F.). It burns with a bluish flame, yielding Carbon Dioxide and Sulphur Dioxide as products of combustion.

The more generally occurring impurities are dissolved Sulphur, Sulphur Dioxide, and Hydrogen Sulphide. Dissolved Sulphur is shown by the residue left on evaporation, Sulphur Dioxide by its bleaching action towards moistened blue Litmus paper, and Hydrogen Sulphide by Lead Acetate.

Litmus.—Blue Litmus paper moistened with Water should not be affected by Carbon Bisulphide, *B.P.* and *U.S.P.*

Residue.—When a portion of Carbon Bisulphide is allowed to evaporate spontaneously in a glass vessel, no residue should be left, *B.P.* and *U.S.P.*

Lead Acetate.—Lead Acetate T.S., agitated with Carbon Bisulphide, should not be blackened, *B.P.* and *U.S.P.*

CARDAMOMI SEMINA.

CARDAMOM SEEDS.

FR., CARDAMOMES; GER., KARDAMOMEN; ITAL., CARDAMOMO;
SPAN., CARDAMOMO MENOR.

The dried, ripened Seeds of *Elettaria Cardamomum*. *B.P.* states that the seeds should be kept in their pericarps, and separated when required for use.

1 of Fruit yields about ¾ of Seeds.

Medicinal Properties.—Stomachic, carminative, and flavouring agent; a useful adjuvant to purgatives to prevent griping.

Official Preparation.—Tinctura Cardamomi Composita. Contained in Extractum Colocynthidis Compositum, Pulvis Cinnamomi Compositus, Pulvis Cretæ Aromaticus, Tinctura Gentianæ Composita, Tinctura Rhei Composita. Of the **Tincture** contained in Decoctum Aloes Compositum, and Mistura Sennæ Composita.

Not Official.—Oleum Cardamomi, Tinctura Cardamomi, Tinctura Carminativa, and Mistura Carminativa.

Descriptive Notes.—The Cardamoms of commerce are derived from several species, but the official kind is limited to the fruits of typical *Elettaria Cardamomum*, Maton, by the measurements given, viz., ⅖ to ⅘ in. (1 to 2 cm.), and by the 'pale buff' colour. The varieties of this Cardamom, as met with in trade, are known as Malabar, Mysore, and Mangalore, whether imported from those districts or from Ceylon, where Cardamoms are largely cultivated. The Malabar variety consists of short, plump, firm capsules well filled with seeds; those of Mangalore are similar, but more or less warty on the surface; and those of Mysore are longer and less compactly filled with seeds, and consequently can be more easily compressed between the fingers. These varieties may also be met with in a bleached form, obtained by moistening them and submitting them to the action of Sulphurous Acid gas, in which case they present a smoother surface, the natural longitudinal striations being somewhat obscured in the process. For galenical purposes the shorter fruits showing the natural striations are to be preferred since their natural colour shows their good quality and their plumpness indicates a large proportion of seed to husk, and seeds more fully matured than in the Mysore kind. The fruits are usually collected before they are quite ripe to prevent the pericarp splitting open. Such partially open fruits as do occur are apparently sorted out and husked by being passed between rollers, or by similar means, since a certain amount of 'split' seed is offered in commerce.

The seeds should not be removed from the pericarps until required for use. The loose seeds obtainable in commerce present the possibility of being obtained from other than the official species, and in any case are likely to be deficient in aroma from exposure to the air.

The distinguishing microscopical characters of the powdered official Cardamoms are the perisperm cells, containing small starch grains, and prismatic Calcium Oxalate crystals, the dark coloured polyhedral cells of the inner integument, and the thick-walled linear cells with oblique ends, of the epidermal layer. The presence of the pericarp in the powder may be detected by the straight-walled, polygonal cells of the epidermal parenchyma, spiral vessels, and small cells containing brown resin.

The other varieties of Cardamom occurring in commerce at more or less regular intervals are the var. *majus* of the official kind, known as Wild Ceylon Cardamom, which have longer, greyish fruits; the Greater or Korarima Cardamom (*Amomum Korarima*, Pereira), which is about $1\frac{1}{2}$ in. (37 mm.) long and $\frac{3}{4}$ in. (19 mm.) broad at the base, and of a dull brownish colour; the cluster Cardamom (*Amomum Cardamomum*, L.), which is whitish, spherical, nearly smooth, and about $\frac{1}{2}$ in. (12·5 mm.) in diameter; all of these have seeds resembling the true Cardamom in flavour. The Bengal Cardamom (*A. aromaticum*, Roxb.), the Nepaul (*A. subulatum*, Roxb.) and the bitter-seeded Cardamom, all having a brown pericarp, are more rarely imported; but the seeds, freed from the husk, and when offered in commerce in the form of powder for use in pills are not so easy of recognition as the fruit, and are best detected by a microscopical examination, *see P.J.* (4) vi. p. 280. The official seeds are dark reddish-brown and 3 mm. ($\frac{1}{8}$ in.) in diameter, angular and transversely wrinkled.

Tests.—Cardamoms are officially required to yield not more than 4 p.c. of ash. Determinations of the ash of Pericarps, Seeds, and Pulvis made in the author's laboratory yielded: Pericarps (three samples), 10·4, 12·0, 13·4 p.c.; Seeds (three samples), 2·38, 2·81, 3·85 p.c.; Pulvis (three samples), 7·56, 6·33, 9·93 p.c.; these results seem to indicate that the Pulvis Cardamomi was not obtained from the seeds only as directed in the Pharmacopœia. Even whole fruits had but an average of 5·5 p.c. A maximum ash limit of 6 p.c. has been recommended.

Foreign Pharmacopœias.—The Fruit is official in Austr., Dan., Dutch, Ger., Hung., Jap., Mex. (Cardamomo menor), Norw., Port., Russ., Swed., Swiss and U.S. Not in Ital.

Preparation.

TINCTURA CARDAMOMI COMPOSITA. COMPOUND TINCTURE OF CARDAMOMS.

Cardamom Seeds, bruised, 1 oz.; Caraway Fruit, bruised, 1 oz.; Raisins of commerce, freed from seeds, 8 oz.; Cinnamon Bark, bruised, 2 oz.; Cochineal, in powder, 220 grains; macerated with 80 fl. oz. of Alcohol (60 p.c.). (1 in 80)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in U.S., 1 in 40, contains Glycerin, and is made with the Fruit of the Cardamoms. Not in the others.

Tests.—Compound Tincture of Cardamoms has a specific gravity of 0·945 to 0·950; it contains about 6 p.c. w/v of total solids and about 56 p.c. w/v of Absolute Alcohol.

Not Official.

OLEUM CARDAMOMI.—A pale yellow aromatic oily liquid distilled from Cardamom Seeds; which contain about 4 to 6 p.c.

Tests.—Cardamom Oil is distilled chiefly from Ceylon Cardamoms. It has a specific gravity of 0·933 to 0·943, an optical rotation of + 26° to + 34°, in a 100 mm. tube. It is soluble in 4 parts and more of Alcohol (70 p.c.), and should possess a Saponification value of 132.

Schimmel states that Mysore (Ceylon) Cardamom Oil has a specific gravity of 0·895 to 0·905; but Parry has been unable to confirm these figures and shows that there is practically no difference between the two Oils.

TINCTURA CARDAMOMI.—Cardamom Seeds, bruised, 1; Alcohol (60 p.c.), *q.s.* to yield 10; by percolation.

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

The *B.P.C.* Tincture, also 1 in 10, is made by maceration.

Foreign Pharmacopœias.—Official in U.S., 1 of Fruits in 5 of Alcohol (48·9 p.c.), by percolation; Port. and Swiss, 1 in 5 (weight).

TINCTURA CARMINATIVA (*B.P.C. Formulary* 1901). — Cardamom Seeds, bruised, 600 grains; stronger Tincture of Ginger (*B.P.* '85), 1¼ fl. oz.; Oil of Cinnamon, 100 minims; Oil of Caraway, 100 minims; Oil of Cloves, 100 minims; Alcohol (90 p.c.), *q.s.* to yield 20 fl. oz.; macerate the Cardamoms in 15 fl. oz. of the Spirit for a week, decant, express, and dissolve the Oils in the mixed Tinctures, and add the remainder of the Alcohol.

Dose.—2 to 10 minims = 0·12 to 0·6 c.c.

This has been incorporated in the *B.P.C.*

By replacing the Cardamom Seeds with $\frac{1}{25}$ of Oil of Cardamoms the maceration is avoided.

MISTURA CARMINATIVA.—Sodium Bicarbonate, 60 grains; Aromatic Spirit of Ammonia, 72 minims; Compound Tincture of Cardamoms, 144 minims; Glycerin, 240 minims; Dill Water, to 6¼ fl. oz.

This corresponds to Mistura Carminativa (*B.P.C.*).

Several formulas are given in *Ph. Form.*

CARUI FRUCTUS.

CARAWAY FRUIT.

Fr., Carvi; Ger., Kümmel; Ital., Carvi; Span., Alcaravea.

The dried Fruit of *Carum Carvi*, L.

Cultivated in different parts of Europe. The herb flowers in the second year, and the fruit ripens in July or August. Yields from 3 to 7 p.c. of Oil, varying with the source of the Seeds.

Medicinal Properties.—Aromatic, stomachic, and carminative. Used in flatulent colic, as an adjuvant to other medicines, to prevent griping of purgatives, and as a flavouring agent.

Official Preparations.—Aqua Carui, and Oleum Carui. Contained in Confectio Piperis, Pulvis Opii Compositus, Tinctura Cardamomi Composita, Tinctura Sennæ Composita. The **Oil** is contained in Pilula Aloes Barbadensis.

Foreign Pharmacopœias.—Official in Austr., Ger., Mex. (Alcaravea), Port. (Alcaravie), Swed., Swiss and U.S. Not in the others.

Descriptive Notes.—The principal varieties of Caraway fruit met with in commerce in this country are the English, Dutch and Russian, which differ in size, colour and aroma. The English command the highest price, and are light brown in colour and slightly larger than the Dutch, which are a dark brown and cheaper, and are the kind usually sold by grocers. According to the official description they should be 'about' $\frac{1}{6}$ to $\frac{1}{4}$ in. (4 to 6 mm.) long and about $\frac{1}{25}$ in. (1 mm.) broad, tapering towards each end, and would include these two. The Russian Caraways are small and mixed with a considerable quantity of stalks and debris and are chiefly used in veterinary medicine. The Mogador Caraway is occasionally imported. It is the largest of all, and is usually slightly enlarged at the upper end, and consequently would be excluded by the *B.P.* statement that they are tapering at each end. The Dutch, Norwegian and East Russian are chiefly used in Germany for distillation. The value of the oil depends upon the amount of Carvone it contains. The exhausted seeds are dried and sometimes used for purposes of adulteration, but they may be detected by their darker colour, weaker taste, and shrivelled appearance, and (under a good lens) by the torn outer layer of cells. Under the microscope the most noticeable features of the powder are the pitted walls of the cells of the outer epidermis, which, like those of Anise, are striated, but are more oblong in outline, and about twice as long as broad; the parallel, thin-walled, elongated, oblong cells of the inner epidermis about four times as long as broad; the absence of raphides and hairs.

Tests.—Caraway Fruit leaves about 6 p.c. of ash on incineration, and 8 p.c. should not be exceeded. Six samples of the Fruit examined in the author's laboratory showed from 5·72 to 7·1 p.c.; 5 samples of the powdered fruit gave from 5·87 to 7·15 p.c.

Preparations.

AQUA CARUI. Caraway Water.

Caraway Fruit, 1; Water, 20; distil, 10. (1 in 10)

Dose.—1 to 2 fl. oz. = 28·4 to 56·8 c.c.

Foreign Pharmacopœias.—Official in Jap. and Swed. Not in the others.

OLEUM CARUI. OIL OF CARAWAY.

A colourless or pale yellow, mobile liquid, possessing a characteristic and aromatic odour and a spicy taste.

The Oil distilled from Caraway Fruit. It consists principally of a terpene, Dextro-limonene, and an oxygenated compound of a ketone nature, Carvone. It is the latter to which the oil owes its medicinal properties.

It should be kept in well-stoppered amber-coloured glass bottles and protected as much as possible from the light. It should be kept in a cool place.

Dose.—½ to 3 minims = 0·03 to 0·18 c.c.

Foreign Pharmacopœias.—Official in Austr. (Carvone), Ger., Jap. (Carvonum), Port., Swiss and U.S.; Swed. (Carvone). Not in the others.

Tests.—Caraway Oil has a specific gravity of 0·907 to 0·920 and an optical rotation of from + 70° to + 80° in a 100 mm. tube. The *B.P.* gives the specific gravity but no optical rotation, neither does it make any mention of the solubility of the oil in Alcohol (90 p.c.); it gives the specific gravity as 0·910 to 0·920; the *U.S.P.* gives 0·900 to 0·910 at 25° C. (77° F.). The *U.S.P.* gives the optical rotation as + 70° to + 80° in 100 mm. tube at a temperature of 25° C. (77° F.). The oil should yield a clear mixture with an equal volume of Alcohol (90 p.c.), and with 3 to 10 volumes of Alcohol (80 p.c.). The *U.S.P.* gives the Alcohol solubility. As pointed out above, Carvone is official in place of the oil in several Foreign Pharmacopœias, and commercial oils are frequently met with from which the Carvone has been abstracted. Such abstraction is shown by the specific gravity and by the optical rotation; oils from which the Carvone has been taken having a specific gravity of about 0·848 and an optical rotation of over + 100°.

Carvone forms crystalline compounds with Hydroxylamine, with Hydrogen Sulphide, and with Phenylhydrazine, but its actual determination, owing to difficulties inseparable from the process, can only be made with approximate accuracy. A measured quantity of 5 c.c. of the oil is treated in a test-tube with 5 c.c. of Phenylhydrazine and the tube allowed to stand in boiling Water for an hour. The excess of Phenylhydrazine is removed by adding whilst hot 5 c.c. of Glacial Acetic Acid, and after shaking diluting with Water to 20 c.c. The contents are then cooled, the crystals removed by filtration and washed with Water until of a pale yellow colour. They may be recrystallised from a definite volume of Alcohol (90 p.c.).

Not more than 15 p.c. of the oil should distil below 185° C. (365° F.), and at least 55 to 65 p.c. should distil above 200° C. (392° F.); the fraction distilling between 220° to 230° C. (428° to 446° F.) should amount to at least 40 to 50 p.c.

The higher the specific gravity and the greater the solubility in Alcohol (50 p.c.) the more Carvone is likely to be contained in the sample.

Not Official.

CARVONE.—A colourless or pale yellow fluid possessing a characteristic aromatic odour and taste. When obtained from the Oils of Caraway and Dill it is stated to be dextrogyrate, and lævogyrate when obtained from Oil of Spearmint.

Tests.—Carvone has a specific gravity of not less than 0·960 and a boiling point of 229° to 230° C. (444·2° to 446° F.). It should be soluble in 2 parts by weight of Alcohol (68 to 69 p.c.). It forms crystalline compounds with Hydroxylamine, Hydrogen Sulphide and Phenylhydrazine, and may be determined quantitatively by means of Hydroxylamine or Phenylhydrazine. Carvone which has been exposed to the air when dissolved in an equal volume of Alcohol (90 p.c.) yields a reddish-violet coloration with Ferric Chloride Test-solution, which disappears on the further addition of Ferric Chloride Test-solution.

It is official in Austr., Ger., Jap. and Swed. in place of the Oil.

CARYOPHYLLUM.

CLOVES.

Fr., Girofle; Ger., Gewürznelken; Ital., Garofani;
Span., Clavo de Especia.

The dried Flower-buds of *Eugenia caryophyllata.*

Imported from Penang, Bencoolen, Amboyna, and Zanzibar. Yield from 15 to 18 p.c. of Oil.

Medicinal Properties.—Aromatic, stomachic, carminative, antispasmodic. Administered to check nausea, vomiting, and flatulence, and to promote digestion. But chiefly used as an adjuvant to other medicines. The oil, as a counter-irritant, is a useful ingredient in liniments for whooping-cough and bronchitis; it is also used as an anodyne in toothache.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Prescribing Notes.—*The Oil may be given upon a lump of Sugar, and is a useful constituent of aperient pill masses. The Infusion is a nice flavouring for many mixtures.*

Incompatibles.—*See* under Infusum Caryophylli.

Official Preparations.—Infusum Caryophylli, and Oleum Caryophylli. Used in the preparation of Infusum Aurantii Compositum. Contained in Pulvis Cretæ Aromaticus. The **Oil** is contained in Pilula Colocynthidis Composita, and Pilula Colocynthidis et Hyoscyami.

Not Official.—Infusum Caryophylli Concentratum and Eugenol.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex. (Clavo de Especia), Norw., Port. (Cravinho), Russ., Span., Swed., Swiss and U.S.

Descriptive Notes.—Cloves consist of the dried flower-buds of *Eugenia caryophyllata*, Thunb., the lower portion of which is formed of a calyx tube, enclosing in its upper half the ovary filled with minute ovules. It derives its name from the French word for a nail, *clou*, from its resemblance to a short nail in shape. The finest varieties in English commerce are imported from Penang, Bencoolen and Amboyna, and in French commerce from Réunion and Madagascar.

Those from Ceylon and the Seychelles are of medium quality and size and darker coloured. Those from Zanzibar and Pemba are more slender and the globular head is often broken. These last two varieties form about four-fifths of the world's production. The official Cloves should be ⅝ in. (15 mm.) long, and should emit oil when indented with the finger nail. The 'stems' or stalks of the flowers are imported separately, and used for distillation of oil. Cloves exhausted of oil by distillation have been used to adulterate genuine Cloves, but yield no oil when pressed with the nail and float horizontally when put in Water. Powdered Cloves have been adulterated with Clove stalks and with the fruit of Cloves, known in commerce as Mother Cloves. The former may be detected by the presence of sclerenchymatous cells and the latter by the presence of starch granules, neither of which occur in Cloves.

Tests.—Cloves yield when incinerated about 5 p.c. of ash, and 8 p.c. should not be exceeded. Eight samples examined in the author's laboratory yielded from 4·78 to 5·4 p.c., 5 samples of the powder yielded from 5·2 to 6·97 p.c. of ash. The Ether extract should amount to 20 p.c. The *B.P.* limit of ash is 7 p.c., and the *U.S.P.* 8 p.c.

Preparations.

INFUSUM CARYOPHYLLI. Infusion of Cloves.

Cloves, bruised, 1; Distilled Water, boiling, 40; infuse for fifteen minutes; strain. (1 in 40)

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.

Incompatibles.—Lime Water, salts of Iron, mineral acids, Gelatin.

OLEUM CARYOPHYLLI. Oil of Cloves.

Fr., Essence de Girofle; Ger., Nelkenöl; Ital., Essenza di Garofani; Span., Esencia de Clavo.

A pale yellow, limpid, highly refractive liquid possessing a characteristic aromatic odour and taste; distilled from Cloves. The yield of oil is from 15 to 18 p.c.

It becomes darker in colour with age and on exposure to air, and should therefore be kept in well-stoppered, dark amber-tinted glass bottles, and protected as far as possible from contact with the air.

The oil contains from 70 to 85 p.c. of Eugenol, a phenol having the formula $C_{10}H_{12}O_2$, a sesquiterpene, Caryophyllene, Methyl Alcohol, Furfurol, and a trace of Vanillin.

Solubility.—1 in 60 of Alcohol, (60 p.c.); in all proportions of Alcohol (90 p.c.), Ether, and Strong Acetic Acid.

Dose.—½ to 3 minims = 0·03 to 0·18 c.c.

Foreign Pharmacopœias.—Official in Austr. (Eugenol), Belg. (Eugenol), Dan., Dutch (Eugenol), Fr., Ger. (Eugenol), Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed. (Eugenol), Swiss and U.S.

Tests.—Clove Oil has a specific gravity of 1·048 to 1·068, it is officially required to be not below 1·050; the *U.S.P.* gives 1·040 to

1·060 at 25° C. (77° F.). Some genuine oils are occasionally met with of a lower specific gravity than that given in the *B.P.*, but rarely lower than 1·045. Both the *B.P.* and the *U.S.P.* require the oil to form a semi-solid yellowish mass when shaken with an equal volume of strong Ammonia Solution; the *U.S.P.* also mentions that concentrated Potassium Hydroxide Solution produces a similar result. When dissolved in Alcohol (90 p.c.) it is officially required to yield a blue coloration on the addition of Ferric Chloride Test-solution. The *U.S.P.* dissolves 2 drops of the oil in 4 c.c. of Alcohol (94·4 p.c.) and adds a drop of Ferric Chloride Test-solution, when a bright green colour will be produced, but a drop of a solution of Ferric Chloride Test-solution diluted with 4 times its volume of Water produces a blue coloration changing to yellow. This is as far as the official tests take us.

The optical rotation of the oil is about −1° in a 100 mm. tube. No appreciable quantity of the oil should distil below 246° C. (474·8° F.). Eugenol may be determined approximately by treating a weighed quantity of 10 grammes of the oil in a flask with a long graduated neck with 100 c.c. of a 10 p.c. Potassium Hydroxide Solution, adding sufficient of the Hydroxide Solution to bring the level of the aqueous liquid to the zero mark, and reading off the volume of the unabsorbed portion which rises to the surface. This volume multiplied by 0·908 (the specific gravity of Caryophyllene) gives approximately the percentage by weight of the latter. The results are only approximate, owing to the solubility of the Caryophyllene in the Potassium Hydroxide Solution and Potassium Eugenate. The *U.S.P.* describes this process, but works by volume and not by weight. Thus determined, the *U.S.P.* Oil of Cloves is required to contain at least 80 p.c. of Eugenol. No method of determination is given in the *P.G.*

A more accurate process is that of Thoms, which consists in converting the Eugenol into Benzoyl-eugenol by means of Benzoyl Chloride. A weighed quantity of 5 grammes of the oil is treated in a beaker having a capacity of about 150 c.c., with 20 grammes of Sodium Hydrate solution (15 p.c.) and 6 grammes of Benzoyl Chloride. The mixture is well shaken until uniformly mixed. After cooling, 50 c.c. of Water are added, and the mixture heated until the crystalline mass has again become oily, and is again allowed to cool. The clear supernatant liquid is filtered off and the crystalline mass in the beaker is again treated with two successive quantities of 50 c.c. of Water. The moist Benzoyl-eugenol is treated with 25 c.c. of Alcohol (90 p.c. by weight) and heated on a water-bath until solution is effected. The beaker is removed from the water-bath and agitated until the Benzoyl-eugenol has separated in fine crystals. The mass is then cooled to 17° C. (62·6° F.), the crystalline precipitate transferred to a small weighed filter paper, the filtrate collected in a graduated cylinder and washed with Alcohol (90 p.c. by weight) until it measures 25 c.c. The filter and crystals are transferred to a weighing bottle, dried at 100° C. (212° F.) till constant in weight and then weighed. The solubility of pure Benzoyl-eugenol in Alcohol

(90 p.c. by weight) has been experimentally proved to be 0·55 gramme, and the latter weight should be added to the weight of the crystals obtained. 266·11 parts of Benzoyl-eugenol represent 162·86 parts by weight of Eugenol.

The quality of Clove Oil is reduced by the abstraction of a portion of Eugenol, the addition of oil from Clove stems, and the addition of Turpentine or Petroleum. The abstraction of Eugenol is shown at once by the altered physical characteristics of the oil as well as by a determination of the amount of this constituent. Turpentine or Petroleum is revealed by a low boiling point and by the solubility of the oil in Alcohol (90 p.c.). Clove Oil from the stems can only be satisfactorily detected by the difference in odour, though the presence of Acetyl-eugenol in Clove Oil and not in oil from the stems has been suggested as a means of distinction.

The *U.S.P.* includes a test for Phenol with Ferric Chloride T.S., requiring that no blue or violet coloration should be produced when the oil is shaken with 20 times its volume of hot Water, cooled, the excess of oil removed by filtration through a wet filter paper and the filtrate tested with a drop of Ferric Chloride Test-solution.

Determination.—A measured quantity of 10 c.c. of the Oil is introduced into a flask with a long neck graduated in tenths, and 100 c.c. of Potassium Hydroxide Test-solution added, the mixture being shaken for five minutes. After complete separation of the liquids, sufficient of the Potassium Hydroxide Solution is added to raise the lower limit of the oily layer to the zero mark of the scale, and the volume of the residual liquid is read off. This should not amount to more than 2 c.c., indicating the presence of at least 80 p.c. of Eugenol, *U.S.P.*

Not Official.

INFUSUM CARYOPHYLLI CONCENTRATUM.—1 of Cloves in No. 10 powder, macerated for seven days in 2½ of Alcohol (20 p.c.), and subsequently percolated so as to make 5 of concentrated Infusion.

This corresponds to Infusum Caryophylli Concentratum, *B.P.C.*, and closely resembles Inf. Caryoph. Conc. given in *Ph. Form.* It is intended for dilution, 1 of this and 7 of Distilled Water.

EUGENOL.—A phenol, having the formula $C_{10}H_{12}O_2$, eq. 162·86, is the principal constituent of Clove Oil. It is a colourless, pale yellow, highly refractive liquid, possessing a powerfully aromatic odour and taste. It darkens on exposure to air and light, and should be preserved in well-closed, dark amber-tinted glass bottles, and kept as far as possible from contact with the air.

Tests.—Eugenol has a specific gravity of 1·072 to 1·074. Its boiling point is 251° to 253° C. (483·8° to 487·4° F.). It dissolves with difficulty in Water, but is readily soluble in Alcohol (90 p.c.), Ether, and Glacial Acetic Acid. A clear liquid, readily becoming turbid on exposure to air, is formed when 1 gramme of Eugenol is mixed with 26 c.c. of Water and 4 c.c. of Sodium Hydroxide Solution (15 p.c.). A flocculent precipitate, partially adherent to the sides of the vessel, is produced when 5 drops of Eugenol are shaken with 10 c.c. of Lime Water. An alcoholic solution of Eugenol yields with Ferric Chloride Test-solution a blue coloration, and with diluted Ferric Chloride Test-solution (1 to 10) a blue coloration changing to greenish-yellow. One part by weight of Eugenol should be soluble in two parts by weight of Alcohol (68 to 69 p.c.). Eugenol is converted into a crystalline body by means of Benzoyl Chloride, and this property may be utilised for its determination. The method is described under Oil of Cloves. Eugenol is official in place of Clove Oil in the new editions of the Austrian, Belgian, and Dutch Pharmacopœias. It was made official in the fourth edition of the German Pharmacopœia, which includes a test for the presence of Phenol.

Eugenoform (Sodium Eugenol Carbinol). Colourless foliaceous crystals, readily soluble in water; slightly soluble in Alcohol (90 p.c.); insoluble in Ether. Introduced as an intestinal and stomachic antiseptic.—*P.J.* '99, ii. 40.

Dose.—7½ to 15 grains = 0·5 to 1 gramme, twice a day.

CASCARA SAGRADA.

CASCARA SAGRADA.

B.P.Syn.—Rhamni Purshiani Cortex; Sacred Bark.

Fr., Cascara Sagrada; Ger., Sagradarinde, Amerikanische Kreuzdornrinde; Ital., Cascara Sagrada; Span., Cascara Sagrada.

The dried Bark of *Rhamnus Purshianus.*

Obtained from California, best collected in spring and early summer. Bark which has been gathered for two years is much preferred to the recently-dried bark.

Medicinal Properties.—Tonic laxative. Acts principally on the large intestine. Indicated in obstinate and habitual constipation, especially of old or delicate persons, and in an atonic condition of the stomach and bowels, as in anæmia. It should not be given as a purgative, but in such a constant continuous manner that a normal condition will be brought about. It is better to give two small doses, say 20 minims of the liquid extract night and morning, than one large dose. The dose should be reduced gradually.

Prescribing Notes.—*Usually given in the form of Extract in Pills or Pilules, or one of the fluid preparations. The Extract is best made into Pills with the addition of one-tenth of its weight of Gum Acacia in powder, and massed with Alcohol* (90 *p.c.*). *It is also advantageously combined with Extract of Belladonna, Extract of Nux Vomica, and Euonymin. Obtainable in the form of Compressed Tablets. Capsules may be had containing a very concentrated Fluid Extract, equivalent to* 15 *and* 30 *minims of the ordinary Fluid Extract, and other strengths as desired. In Mixtures and other fluid preparations it goes well with Aromatic Spirit of Ammonia and Spirit of Chloroform.*
Elixir of Cascara (Kasak) is an agreeable and reliable preparation. *See* below.

Official Preparations.—Extractum Cascaræ Sagradæ, Extractum Cascaræ Sagradæ Liquidum, and Syrupus Cascaræ Aromaticus.

Not Official.—Capsules of Cascara, Elixir of Cascara, Extractum Cascaræ Liquidum Insipidum, Mistura Cascaræ Sagradæ, Mistura Cascara Sagrada Composita, Mistura Cascara Aperiens, Mistura Laxativa, Pilulæ Cascaræ Compositæ, Pilula Cascara et Belladonnæ et Nucis Vomicæ, Fluidextractum Rhamni Purshiani Aromaticum, Vinum Rhamni Purshiani.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ital., Jap., Mex., Norw., Russ., Span., Swed., Swiss and U.S. Not in the others.

Descriptive Notes.—The bark of *Rhamnus Purshianus*, DC., as met with in commerce, varies much in appearance and quality. Genuine Cascara Sagrada is more or less externally furrowed longitudinally, and of a reddish-brown tint, with lenticels about ¼ inch long, forming slender, whitish, transverse scars in places; it has a characteristic leather-like odour. When the outer surface is scraped the reddish-brown colour of the layer beneath becomes visible; it is of a duller red tint than that of *Rhamnus Frangula*, L. The inner surface is longitudinally striate with projecting medullary rays, and in some pieces faintly corrugated transversely, and is turned red by alkalis. The *B.P.* limits the thickness to about $\frac{1}{16}$ inch (1·5 mm.), *U.S.P.* 1 to 5 mm., which indicates that the thin bark is to be used, probably for the reason that older and thicker bark is usually more bitter. The *U.S.P.* directs that the bark should be kept at least one year before being used, but the *B.P.* does not give any such direction. The recently collected bark is stated to cause vomiting, hence the importance of the mandate. The inner surface varies from pale brown to dark brown, or walnut colour if badly dried. The transverse fracture of the bark is buff coloured or pale brown, but when the bark is kept it becomes darker; that which is thus darkened, as seen in transverse section, is therefore to be preferred, as indicating that it was not recently collected. An inferior variety of thick bark known in the United States as spurious or 'winter' bark, is said to be removed in winter by steaming the branches to soften the bark, and then cutting it off with knives. Another winter form is spoke-shaved, and therefore in chips. The new crop is collected from the end of April till July, and reaches London in August. Sometimes the bark of *R. Californicus*, Esch., and its var. *tomentella*, Benth., is substituted for it, but, according to Rusby, it is only bark that is received from Texas, Arizona, Colorado and New Mexico that is likely to contain it, since the species occurs sparingly only in North California and not in Oregon and Washington, whence supplies of *R. Purshianus* have come during recent years. The chief difference is that the bark of *R. Californicus*, Esch., is of a greyer tint externally, and the lenticels are less numerous and easily become obscured, and the transverse fracture is less dark and more yellow (J. G. Steele) than that of *R. Purshianus*, and the taste is intensely bitter. Under the microscope the bark of *R. Purshianus* is seen to have parallel medullary rays, consisting commonly of two rows of cells, whilst those of *R. Californicus* are shorter, crooked, and not parallel, and are composed of three or more rows (Prescott). The bark of *R. Purshianus* is apt to stain paper yellow, due to the presence of Frangulin. The powdered bark of *R. Purshianus* may be distinguished from that of *R. Frangula* by the presence of sclerenchymatous cells; mucilage is absent. In both, the contents of the parenchymatous cells turn purplish with caustic alkali (*Vogl*). The bark of *Rhamnus Frangula* has no sclerenchymatous cells and contains mucilage.

Tests.—Cascara Bark yields on incineration about 5 p.c. of ash; 8 p.c. should not be exceeded. A limit of 6 p.c. of ash has been suggested. Specimens of good quality bark examined in the author's laboratory showed from 5·6 to 7·8 p.c. of ash.

Preparations.

EXTRACTUM CASCARÆ SAGRADÆ. EXTRACT OF CASCARA SAGRADA. *B.P.Syn.*—EXTRACTUM RHAMNI PURSHIANI.

Cascara Sagrada, in No. 20 powder, is exhausted by percolation with Distilled Water and evaporated to dryness on a water-bath.

The powdered Bark is moistened with Water and allowed to swell, before it is packed loosely in the percolator.

It is an aqueous exhaustion; in *B.P.* 1885 it was by percolation with Proof Spirit.

Dose.—2 to 8 grains = 0·13 to 0·52 gramme.

Extractum Rhamni Purshiana (*U.S.*) is made by exhausting 100 of Cascara Bark in No. 60 powder by percolation with Alcohol (12·5 p.c.), evaporation to dryness, and mixing with sufficient peeled Russian Liquorice Root in No. 80 powder to make the product 25.

Foreign Pharmacopœias.—Official in Belg., Fr., Ital., Mex. and U.S. Not in the others.

EXTRACTUM CASCARÆ SAGRADÆ LIQUIDUM. LIQUID EXTRACT OF CASCARA SAGRADA. *B.P.Syn.*—EXTRACTUM RHAMNI PURSHIANI LIQUIDUM.

5 of Cascara Bark exhausted by percolation with Distilled Water; the percolate evaporated to 3; 1 of Alcohol (90 p.c.) mixed with 1 of Distilled Water is added, and the whole is made up to 5 by the addition of more Water if necessary.

It is almost the same as *B.P.* 1885.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Sometimes given with Ferri et Ammonii Citras and Ammonia.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ital., Jap., Mex., Norw., Russ., Span., Swed., Swiss and U.S., all with diluted Alcohol. U.S. is 38 p.c. Alcohol. Dan. and Swed. contain Glycerin. Not in the others.

Tests.—Liquid Extract of Cascara has a specific gravity of 1·055 to 1·070; may contain from 17 to 27 p.c. w/v of total solids and about 20 p.c. w/v of Absolute Alcohol.

SYRUPUS CASCARÆ AROMATICUS. AROMATIC SYRUP OF CASCARA.

Liquid Extract of Cascara Sagrada, 8; Tincture of Orange, 2; Alcohol (90 p.c.), 1; Cinnamon Water, 3; Syrup, 6.

(1 of Liquid Extract in 2½)

Dose.—½ to 2 fl. drm. = 1·8 to 7·1 c.c.

Not Official.

CAPSULES OF CASCARA.—Two strengths, containing concentrated Extract equal to 15 and 30 minims respectively of Fluid Extract.

FLUIDEXTRACTUM RHAMNI PURSHIANÆ AROMATICUM (*U.S.*).—Cascara Sagrada, in No. 40 powder, 1000; Glycyrrhiza, in No. 30 powder, 100; Magnesium Oxide, 125; macerate with 2000 of Water for 12 hours, then dry it at a gentle heat. Percolate this with 250 c.c. of Glycerin mixed with 500 c.c. of Alcohol (94·9 p.c.) and 250 c.c. of Water, subsequently complete the percolation with diluted Alcohol until exhausted; reserve the first 800 of the percolate and evaporate the remainder to a soft Extract, dissolve this in the reserved portion. Add 10 c.c. of Compound Spirit of Orange, and *q.s.* of Diluted Alcohol to make 1000 of fluid Extract.

EXTRACTUM CASCARÆ SAGRADÆ LIQUIDUM INSIPIDUM.—Liquid Extract of Cascara Sagrada, 100; Liquor Ammoniæ Fortior, 7; heat them together on a water-bath for 3 hours or until the bitterness has disappeared, and finally make up the volume to 100 with the requisite quantity of Alcohol (90 p.c.) and Water.

The formula given in *B.P.C.* employs 5 of Potassium Hydroxide in place of the Ammonia given above. The *B.P.C. Supplement* gives a formula for a Miscible Extract of Cascara. It is the aqueous fluid extract of the *B.P.* to which Solution of Potassium Hydroxide is added before evaporation, and the Alcohol (90 p.c.) is replaced by Glycerin. It is stated that the miscible extract should be used in the place of the 'tasteless' liquid extract when making *B.P.C.* preparations.

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

Many formulas have appeared from time to time, with the object of obtaining a tasteless extract without loss of activity, using either Lime, Magnesia, Potassium Hydroxide, or Ammonia; we prefer Ammonia, as, apart from the fact that it makes a better preparation, the excess of Ammonia is volatilised, whereas the Potassium Hydroxide remains in the finished solution. The word 'tasteless' as applied to any of them is a misnomer, and some of the preparations are practically inert. The Bark has a fairly strong flavour peculiar to itself, quite apart from the bitterness.

There is a similar preparation in *Austr.*, named Extractum Rhamni Purshiani Fluidum, in which Magnesia is employed.

ELIXIR CASCARÆ. *Syn.* AROMATIC CASCARA.—Liquid Extract of Cascara Sagrada, 34·5: Liquid Extract of Liquorice, 34·5; Glycerin, 29; Soluble Gluside, 0·75; Oil of Anise, 0·05; Oil of Peppermint, 0·05; Oil of Cloves, 0·025; Oil of Dill, 0·025; Oil of Cinnamon, 0·025; Alcohol, to make 100.

This corresponds with the *B.P.C.* formula; it is also given in *Ph. Form.* as the Elixir Cascara c. Glycerin of the *Australian Ph. Form.*

Various formulas for Aromatic Cascara are given in the Hospital Pharmacopœias under the heading Mistura Cascaræ Composita, in most of which Liquid Extract of Liquorice forms an important flavouring ingredient.

MISTURA CASCARÆ SAGRADÆ. Cascara Mixture.—Liquid Extract of Cascara Sagrada, 1 fl. drm.; Liquid Extract of Liquorice, 30 minims; Aromatic Spirit of Ammonia, 40 minims; Chloroform Water, to ½ fl. oz.—*London.*

Liquid Extract of Cascara, 30 minims; Liquid Extract of Liquorice, 30 minims; Aromatic Spirit of Ammonia, 20 minims; Chloroform Water, to 1 fl. oz.—*St. Thomas's.*

This formula has been incorporated in the *B.P.C.*

MISTURA CASCARÆ SAGRADÆ COMPOSITA. Compound Cascara Mixture.—Liquid Extract of Cascara, 1 fl. drm.; Liquid Extract of Liquorice, 30 minims; Sulphate of Soda, 60 grains; Solution of Ammonia, 5 minims; Water, to 1 fl. oz.—*St. Mary's.*

Liquid Extract of Cascara Sagrada, 20 minims; Liquid Extract of Liquorice, 30 minims; Tincture of Belladonna, 5 minims; Tincture of Nux Vomica, 5 minims: Aromatic Spirit of Ammonia, 20 minims; Chloroform Water, *q.s.* to make 1 fl. oz.—*St. Thomas's.*

This formula has been incorporated in the *B.P.C.*

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.

Magnesium Sulphate, 60 grains; Glycerin, 1 fl. drm.; Liquid Extract of Cascara Sagrada, 1 fl. drm.; Liquid Extract of Liquorice, 60 minims; Tincture of Hyoscyamus, 20 minims; Tincture of Nux Vomica, 5 minims; Compound Decoction of Aloes, to 1 fl. oz.—*London.*

MISTURA CASCARÆ APERIENS.—Magnesium Sulphate, 30 grains; Cascara Sagrada Mixture, to ½ fl. oz.—*London.*

MISTURA LAXATIVA.—Liquid Extract of Cascara Sagrada, 1 fl. drm.; Liquid Extract of Liquorice, 1 fl. drm.; Sodium Bicarbonate, 5 grains; Chloroform Water, to 1 fl. oz.—*University* 1904; in the 1907 edition it is made up to 1 fl. oz. with Water.

PILULA CASCARÆ COMPOSITA (Martindale).—Extract of Cascara, 1½; Extract of Nux Vomica and Alcoholic Extract of Belladonna, of each ½;

Milk Sugar, 1. In grains for one pill, or in grammes for fifteen.—*B.M.J.* '93, ii. 596.

PILULA CASCARÆ ET BELLADONNÆ ET NUCIS VOMICÆ.—Extract of Cascara Sagrada, $\frac{4}{5}$ grain; Extract of Nux Vomica, $\frac{1}{10}$ grain; Alcoholic Extract of Belladonna, $\frac{1}{10}$ grain. Mix and divide into one grain pills.—*B.P.C.*

Dose.—1 to 3.

PILULA CASCARA ET EUONYMIN. *See* EUONYMIN.

VINUM RHAMNI PURSHIANI (*Austr.*).—Malaga Wine, 150; Fluid Extract of Cascara Sagrada, 100; Syrup of Orange, 50. Digest eight days and filter. Dutch, Cascara Sagrada Bark 1, Malaga Wine 10.

CASCARILLA.

CASCARILLA.

FR., CASCARILLE; GER., CASCARILLRINDE; ITAL., CASCARIGLIA; SPAN., CHACARILLA.

The dried Bark of *Croton Eluteria*, J. J. Bennett.

It contains from ½ to 2 p.c. of an aromatic Oil.

Medicinal Properties.—Aromatic and stomachic. With some physicians it is a favourite bitter tonic. Used for the same purposes as Calumba.

Prescribing Notes.—*The Infusion quickly changes, and will scarcely keep good for a day in summer, but with an aromatic Tincture it keeps well.*

The Tincture is frequently prescribed with diluted mineral acids, which, however, usually cause a separation of resin; 4 fl. drm. of Mucilage in an 8-oz. mixture will keep the resin diffused.

Official Preparations.—Infusum Cascarillæ and Tinctura Cascarillæ.

Not Official.—Mistura Cascarillæ Composita, Infusum Cascarillæ Concentratum.

Foreign Pharmacopœias.—Official in Austr., Dan., Dutch, Ger., Ital., Jap., Norw., Port., Russ., Swed. and Swiss. Not in Fr., Hung., Mex. or Span. An **extract** is official in Ger.

Descriptive Notes.—Cascarilla bark varies much in size and quality as found in commerce. The best qualities are in quills, or in small curved pieces. The outer dull brown or dark grey cork has longitudinal and transverse small cracks and a silver grey surface with minute black dots, a short resinous fracture, and a dark reddish-brown bast, showing thin whitish medullary rays but no sclerenchymatous cells. It is bitter and agreeably aromatic. The *B.P.* directions are not quite sufficient to characterise the true bark, since the 'silvery grey patches spotted with minute black dots' occur also in a false bark (referred to *Croton lucidus*, Linn.), which causes vomiting and other deleterious effects, and Hartwich has recently shown that of eight Croton barks substituted for Cascarilla since 1901 all agree with it in having 'no groups of sclerenchymatous cells' although differing from Cascarilla bark in other characters (*P.J.* (4) xxiii. p. 485). A very slender bark, obtained by spokeshaving the twigs, often occurs in commerce; this is available for pastilles and incense, but is excluded from use in pharmacy by the *B.P.* description of 'quills from 1 to 3 inches (2½ to 7½ cm.)

or more in length, and from about $\frac{1}{6}$ to $\frac{1}{2}$ inch (4 to 12 mm.) in diameter.' The general bark is characterised by its aromatic odour and taste, and the greyish-brown layer beneath the whitish coat, where the latter is exfoliated. Under the microscope the powdered bark is distinguished by the characteristic cells containing dark brown secretion, the cork cells thickened chiefly on one side, the absence of stone cells and the presence of starch (*Koch*). The properties of the bark are due to a bitter principle, resin, and 1·3 p.c. of volatile oil. The ash varies from 6 to 10 p.c. (*Y.B.P.* 1906, p. 209). During recent years it has been deficient in the amount of bitter principle (Naylor, *Y.B.P.* 1906, p. 209). The bark of *Croton lucidus*, which closely resembles that of Cascarilla in appearance, differs in absence of aroma, reddish-brown tint externally, and in the presence of sclerenchymatous cells. Other substitutes differ from true Cascarilla in odour, as well as in the presence of sclerenchymatous cells in the cortex (*P.J.* (4) xxi. p. 7).

Tests.—Cascarilla leaves about 8 p.c. of ash on incineration, and rarely more than 10 p.c. The average ash of eight samples examined in the author's laboratory showed 8·7 p.c.

Preparations.

INFUSUM CASCARILLÆ. INFUSION OF CASCARILLA.

Cascarilla, in No. 10 powder, 1; boiling Distilled Water, 20; infuse for 15 minutes; strain. (1 in 20)

Half the strength of *B.P.* '85.

Dose.—$\frac{1}{2}$ to 1 fl. oz. = 14·2 to 28·4 grammes.

Incompatibles.—Lime Water and metallic salts.

Not in the other Pharmacopœias.

TINCTURA CASCARILLÆ. TINCTURE OF CASCARILLA.

1 of Cascarilla, in No. 40 powder, percolated with Alcohol (70 p.c.), to yield 5. (1 in 5)

Dose.—$\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Austr., Dan., Ital., Jap., Norw., Russ., Swed. and Swiss, 1 in 5. Not in the others.

Tests.—Tincture of Cascarilla has a specific gravity of 0·895 to 0·905; contains from 2 to 3 p.c. w/v of total solids and about 67 p.c. w/v of Absolute Alcohol.

Not Official.

MISTURA CASCARILLÆ COMPOSITA.—Tincture of Squill, 10 minims; Compound Tincture of Camphor, 20 minims; Infusion of Cascarilla, to 1 fl. oz.—*Royal Free.*

Ammonium Carbonate, 5 grains; Tincture of Squill, 12 minims; Aromatic Syrup, 60 minims; Infusion of Cascarilla, to 1 fl. oz.—*Brompton.*

Compound Tincture of Camphor, 15 minims; Vinegar of Squill, 15 minims; Infusion of Cascarilla, to 1 fl. oz.—*St. Thomas's.*

This formula has been incorporated in the *B.P.C.*

INFUSUM CASCARILLÆ CONCENTRATUM.—Cascarilla Bark, in No. 40 powder, 40 parts; Tincture of Cascarilla, 7·5 parts; Alcohol (90 p.c.), 20 parts; Dilute Chloroform Water, 1 in 1000, sufficient to make 100 parts. Prepare by macero-expression.—*Farr* and *Wright*; *P.J.* '06, i. 165 and '07, i. 621; *C.D.* '06, i. 252; *Y.B.P.* 1907, 249.

This formula appears in the *B.P.C.*

Not Official.

CASSIÆ OLEUM.

OIL OF CASSIA.

A yellowish or brownish liquid, becoming darker and thicker by age and exposure to the air, having the characteristic odour of Cassia, and a sweetish, spicy, and burning taste. It is a volatile Oil distilled from *Cinnamomum Cassia.*

It should be kept in well-stoppered amber-tinted glass bottles, in a cool place, and away from the light.

The principal constituent of Cassia Oil is Cinnamic Aldehyde, of which it should contain at least 75 p.c. Cinnamyl Acetate and traces of Cinnamic Acid are also present. A stearoptene, Ortho-methyl-coumaric aldehyde, has been shown to be a constituent of the oil.

Soluble in an equal volume of Alcohol, the solution being slightly acid to Litmus paper; also soluble in an equal volume of Glacial Acetic Acid.

This Oil is official in the German and U.S. Pharmacopœias under the name 'Oleum Cinnamomi.'

Medicinal Properties.—It possesses the aromatic, carminative and antiseptic properties of Cinnamon bark, but the oil is a powerful local stimulant.

Dose.—½ to 3 minims = 0·03 to 0·18 c.c.

Foreign Pharmacopœias.—Official in Belg., Ger., Jap., Norw., Swiss and U.S.

Tests.—Cassia Oil has a specific gravity of 1·053 to 1·065. It should be optically almost inactive, and should never vary more than one degree to the right or left in a tube of 100 mm. It should be soluble in 3 to 4 parts of Alcohol (70 p.c.), and in all proportions in Alcohol (90 p.c.).

When shaken with an equal volume of Nitric Acid at 0° C. (32° F.), a crystalline mass should result. With Ferric Chloride Solution the alcoholic solution of the oil should give a brown coloration. The oil forms a crystalline compound with Sodium Bisulphite Solution (30 p.c.), and this reaction is utilised as a means of determining the percentage of Cinnamic Aldehyde. A measured quantity of 10 c.c. of the oil is shaken in a flask with a long thin neck graduated to one-tenth c.c., with 10 c.c. of a 30 p.c. Sodium Bisulphite Solution, and warmed in a water-bath until the contents are liquefied. When this has occurred more Sodium Bisulphite Solution is added, the mixture being constantly heated and occasionally shaken until the flask is quite three-fourths filled. The heating in the water-bath is continued until no solid particles are visible, and the odour of Cinnamic Aldehyde has disappeared. When this is effected the contents of the flask are allowed to cool, and sufficient of the 30 p.c. Sodium Bisulphite Solution added to bring the lower level of the oily layer to the zero mark on the graduated neck of the flask, and the number of c.c. is read off. The *U.S.P.* requires that the residual liquid should not measure more than 2·5 c.c., indicating at least 75 p.c. by volume of Cinnamic Aldehyde. The *P.G.* process is to take a measured quantity of 5 c.c. of the oil, and after mixing it with 45 c.c. of a 30 p.c. Sodium Bisulphite Solution, to heat it in a water-bath for two hours with intervals of frequent shaking. Not more than 1·5 c.c. of oil shall remain undissolved, indicating at least 70 p.c. by volume of Cinnamic Aldehyde.

The more generally occurring sophistications are Colophony Resin and Petroleum, Lead and Copper. For the detection of Colophony Resin and Petroleum, the *U.S.P.* mixes 1 c.c. of the oil with 3 c.c. of a mixture of 3 volumes of Alcohol (94·9 p.c.) and 1 volume of Water, when a clear solution should result, and if to this solution 2 c.c. of a saturated Lead Acetate Solution in a mixture of 3 volumes of Alcohol (94·9 p.c.) and 1 volume of Water be added, no precipitate should be produced. The *P.G.* includes a somewhat similar test, dissolving the oil in 3 to 4 parts of Alcohol (90 p.c.), and treating the solution with half its volume of freshly-prepared Lead Acetate Solution. An additional test for Resin is given in the latter Pharmacopœia, 100 parts of the oil, heated on a water-bath until all volatile constituents have been dissipated, should not yield more than 8 parts of residue. The value of this test may be much enhanced by performing it in a tared fractionating flask, and recording the temperature at which the distillate passes over. A quantity of 50 grammes of the oil should be weighed into the flask, and the oil distilled over a direct flame. After the Water has passed over, the thermometer rapidly rises to 240° C. (464° F.), and the major portion of the oil passes over between 240° C. (464° F.) and 260° C. (500° F.). The appearance of white fumes indicates the end of the distillation; the residue should be viscid and tough, and not hard and brittle. The presence of Petroleum is detected by the solubility of the distillate in Alcohol (70 p.c.). The presence of Lead and Copper is due to the solvent action of the Cinnamic Acid produced by the Aldehyde oxidation on the metal of the containing vessels, and is readily detected by Hydrogen Sulphide. Lead is chiefly present in unrectified oils. The *P.G.* includes a colour test with Ferric Chloride Solution for Phenol, requiring that the colour produced on the addition of the Ferric Chloride Solution shall be brown, and not a green or blue.

CINNAMIC ALDEHYDE (C_9H_8O, eq. 131·07).—This Aldehyde is the principal constituent of oils of Cassia and Cinnamon. It may also be prepared artificially by the action of Sodium Hydroxide upon a mixture of Benzaldehyde and Acetic Aldehyde.

A clear, colourless, or pale yellow, highly refractive liquid possessing a characteristic aromatic odour and a sweetish spicy and subsequently burning taste. It should contain not less than 95 p.c. of pure Cinnamic Aldehyde.

Its use in medicine is similar to that of Oil of Cassia.

Dose.—½ to 2 minims = 0·03 to 0·12 c.c.

Foreign Pharmacopœias.—Official in Austr., Swed. and U.S.

Tests.—Cinnamic Aldehyde has a specific gravity of 1·054 to 1·056, and boils about 247° C. (476·6° F.). It is optically inactive. It should conform to the tests given under Cassia Oil. It forms a crystalline compound with Sodium Bisulphite, and when mixed with an excess of a 30 p.c. solution of the salt should dissolve completely leaving practically no oily residue.

It should be free from the sophistications mentioned under Oils of Cassia and Cinnamon.

The *U.S.P.* method of determination is to introduce 12 drops of the Aldehyde into a carefully counterpoised 150 c.c. flask and carefully ascertain the exact weight. 5 c.c. of Distilled Water and a few drops of Rosolic Acid Solution are added and the solution exactly neutralised by the addition of Tenth-normal Volumetric Sodium Hydroxide Solution. A measured quantity of 50 c.c. of a 20 p.c. Sodium Bisulphite solution is then added, and the flask is immersed in a water-bath of boiling Water. Sufficient Semi-normal Volumetric Hydrochloric Acid Solution is added to maintain the neutrality of the liquid and a drop or two of Rosolic Acid Solution, the flask being kept continuously heated and frequently agitated. The number of c.c. of Semi-normal Hydrochloric Acid Solution used is noted when a permanent state of neutrality is reached. A blank test with the same materials without the Cinnamic Aldehyde is used as a control, and the number of c.c. of Semi-normal Volumetric Hydrochloric Acid used in the blank is subtracted from the number of c.c. used in the original. Each c.c. of the difference corresponds to 0·033 gramme Cinnamic Aldehyde.

Not Official.

CASSIA BEAREANA.

A small tree, attaining the height of 20 or 30 feet, growing in equatorial East Africa. A **decoction** of the roots has been recommended in the treatment of blackwater fever and in hæmaturia. The decoction is prepared by the natives by boiling about a dozen pieces of the root, about 1 inch long, in a gallon of Water, and it is administered in teacupful doses. The powdered bark is applied as a dressing to ulcers.—*L.* '02, i. 283; '03, i. 190; *P.J.* '01, ii. 616; '02, i. 42; *C.D.* '03, i. 372.

A **fluid extract** (1 in 1) is also made, dose 30 to 60 minims = 1·8 to 3·6 c.c.

CASSIÆ PULPA.

CASSIA PULP.

FR., PULPE DE CASSE; GER., RÖHRENKASSIE; ITAL., CASSIA; SPAN., CANAFISTULA.

The Pulp from the Fruits of *Cassia Fistula.*

Imported from the East or West Indies.

Medicinal Properties.—Laxative. Useful in small doses for habitual constipation. Large doses occasion nausea, flatulence, and griping; generally given in combination, as in Confection of Senna.

Dose.—60 to 120 grains = 4 to 8 grammes, as a laxative; 1 to 2 oz. = 28·4 to 56·8 grammes, as a purgative.

Official Preparation.—Contained in Confectio Sennæ; 1 part in 8 nearly.

Foreign Pharmacopœias.—Austr., Fruit and Pulp; Belg., Fruit; Ital., Mex., Port. and U.S., Fruit. Not in the others.

Descriptive Notes.—The fruit of the *Cassia Fistula*, L., is a cylindrical, indehiscent pod, separated by thin internal transverse partitions into numerous cells each of which contain a single seed, immersed in a blackish pulp. The pods are chiefly imported from Dominica in the West Indies, but those from the East Indies, which are smaller, smoother, and have a blacker pulp are usually preferred, the pulp of this kind being considered more active. Some of the East Indian pods come from Sourabaya in Java, *viâ* Amsterdam. Pods in which the seeds rattle when shaken are considered old and inferior. The pulp usually forms about 30 p.c. of the weight of the pods. The official description, viz., '1½ to 2 ft. long (35 to 50 cm.) and from ¾ to 1 in. (18 to 25 mm.) in diameter, the sutures being marked by two smooth longitudinal bands,' excludes the fruits of *Cassia grandis*, L., which has larger compressed pods, of which the ventral suture is marked by two prominent marginal ridges, and the surface of the pods has prominent veins. It also excludes the smaller fruits of *Cassia moschata*, H. B. and K., which have a brown pulp. The term viscid applied to the pulp implies that old pods with hard dry pulp should not be used. The extracted pulp will not keep in the viscid condition, soon becoming mouldy, especially in a damp place, and is therefore sometimes met with in commerce in the form of tough extract not easily miscible with the other ingredients of Confectio Sennæ unless first rubbed down with Water. It should therefore be prepared fresh for this purpose. Cassia pulp is said to be one of the ingredients used in Turkey for adulterating Opium.

Not Official.

CASTOREUM.

Fr., Castoréum; Ger., Bibergeil; Ital., Castoreo; Span., Castoreo.

The dried preputial follicles and their secretion, obtained from the Beaver, *Castor Fiber*, L., the oil sacs being rejected.

Medicinal Properties.—Moderately stimulant and antispasmodic; occasionally used in hysteria and spasmodic disorders.

Dose.—Of the powder 5 to 10 grains = 0·32 to 0·65 gramme.

Prescribing Notes.—*The Tincture when mixed with Water will yield a deposit after a time; it should therefore be prescribed with Mucilage of Gum Acacia, 3 fl. drm. in 8-oz. mixture.*

Foreign Pharmacopœias.—Official in all except Belg., Dan., Dutch, Ger., Jap., Swed. and U.S. Both the Canadian and Russian varieties are official in Russ. Austr. not more than 40 p.c. insoluble in hot Alcohol, and not more than 4 p.c. of ash.

Descriptive Notes.—The Castoreum of commerce is chiefly imported from the Hudson's Bay Territory. It consists of two pyriform sacs about 2 in. (5 cm.) long, usually compressed and wrinkled, and one of the sacs is rather longer than the other. The contents of the sac are of a reddish-brown colour, resinous, and softening readily when warmed. Castoreum has a characteristic odour. It is liable to deteriorate unless kept quite dry.

TINCTURA CASTOREI.—Castor, in coarse powder, 1; Alcohol (90 p.c.), 20; macerate seven days, agitating occasionally, strain, press, and add Alcohol *q.s.* to yield 20. (1 in 20)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Austr., Hung., Norw. and Port., 1 in 5; Fr., Ital., Russ. and Swiss, 1 in 10; Mex., 1 and 10; Span., 1 in 25; all by weight. Not in Belg., Dan., Dutch, Ger., Jap., Swed. or U.S.

Russ. contains a Tincture made with Russian Castor, and also one made with Canadian Castor.

CATECHU.

CATECHU.

B.P.Syn.—Catechu Pallidum.

Fr., Cachou; Ger., Katechu; Ital., Catecu; Span., Catecú.

An extract of Leaves and young Shoots of *Uncaria Gambier*, Roxb.

It contains from 30 to 40 p.c. of Catechu-Tannic Acid, from 10 to 40 of Catechin, some mucilage, and mineral matter.

Prepared in Singapore and in other places in the Eastern Archipelago.

Terra Japonica is a trade term (now almost obsolete) applied both to Cutch and Gambier.

Solubility.—Almost entirely soluble in boiling Water. 70 to 75 p.c. is soluble in Alcohol (90 p.c.). 50 to 60 p.c. is soluble in cold Water, and the solution is bright.

Medicinal Properties.—A powerful astringent. Used in diarrhœa, dysentery, gastric and intestinal hæmorrhage and for other purposes for which Tannic Acid is used. Lozenges are the best medium for administering it in relaxed conditions of the throat and in ulcers of the mouth.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Incompatibles.—The Alkalis, metallic salts, and Gelatin.

Official Preparations.—Pulvis Catechu Compositus, Tinctura Catechu, and Trochiscus Catechu.

Not Official.—Mistura Catechu et Cretæ, Mistura Hæmatoxyli cum Catechu.

Foreign Pharmacopœias.—Official in Dutch, Ger., Jap. and Port. (Cato). Not in the others. *See* below, Catechu Nigrum.

Descriptive Notes.—Under the commercial name of Gambier, or more rarely Terra Japonica, several qualities of the drug may be met with. The inferior kinds are largely used for tanning, dyeing and calico printing. The form official in the *B.P.* consists of cubes about 1 in. (25 mm.) in diameter, reddish-brown externally, and pale cinnamon-brown and porous and friable internally. Smaller cubes are also met with in commerce and occasionally parallelograms and discs, or lozenges with fluted margins, but the last two are usually paler in colour and contain Starch. They are used in India for chewing with the Betel-pepper leaf, but are not admissible for pharmaceutical use, since official Catechu should not afford any characteristic reaction with the tests for Starch.

Tests.—Catechu is required officially to be almost completely soluble in boiling Water, and to be soluble to the extent of 70 p.c. in Alcohol (90 p.c.).

It should not yield a pronounced blue coloration on the addition of Iodine Solution to its boiled and cooled aqueous solution, and it is officially required to yield not more than 5 p.c. of Ash when incinerated. A sample examined in the author's laboratory left 4·0 p.c. of ash. The presence of Black Catechu may be detected by the marked green fluorescence produced in the Petroleum Ether solution, when 3 grammes of Catechu are mixed with 25 c.c. of Normal Volumetric Sodium Hydroxide Solution and shaken with 50 c.c. of Petroleum Ether.

The extract official in the *U.S.P.* is prepared from *Ourouparia Gambir*, Baillon, that of the *P.G.* from either *Ourouparia Gambir* or *Acacia Catechu*, Willd. The *P.G.* states the highly-diluted alcoholic solution gives a green coloration with Ferric Chloride T.S. The residue insoluble in Water, after washing with hot Water, should when dried at 100° C. (212° F.) not amount to more than 15 p.c. The *P.G.* ash limit is 6 p.c.; that of the *U.S.P.* not more than 5 p.c.

Preparations.

PULVIS CATECHU COMPOSITUS. Compound Powder of Catechu.

Catechu, 4; Kino, 2; Krameria Root, 2; Cinnamon Bark, 1; Nutmeg, 1. (1 in 2½)

Keep it in a stoppered bottle.

Dose.—10 to 40 grains = 0·65 to 2·6 grammes.

Not in the other Pharmacopœias; a powdered **Black Catechu** is official in Span.

TINCTURA CATECHU. Tincture of Catechu.

Catechu, in coarse powder, 4; Cinnamon Bark, bruised, 1; Alcohol (60 p.c.), 20; prepare by the maceration process.

Now 1 in 5 instead of 1 in 8.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in U.S. (Tinct. Gambir Co.), 1 in 20; Belg., Fr. (Teinture de Cachou), Dutch, Ger., Ital., Jap., Port and Swiss, 1 in 5; Mex., 1 and 5; all by weight (except U.S.), and with the exception of the Dutch, with **Black Catechu.** Not in the others.

Tests.—Tincture of Catechu has a specific gravity of 0·978 to 0·983; should contain 15·5 to 18 p.c. w/v of total solids and about 52 p.c. of Absolute Alcohol. It yields a dirty green coloration with T.S. of Ferric Chloride.

TROCHISCUS CATECHU. CATECHU LOZENGE.

1 grain of Catechu in each, with Simple Basis.

Dose.—1 to 6 lozenges.

Foreign Pharmacopœias.—Official in U.S., 1 grain Gambir in each; Fr. and Dutch, about 1½ grains in each. Not in the others.

Not Official.

MISTURA CATECHU ET CRETÆ.—Tincture of Catechu, 20 minims; Chalk Mixture, to 1 fl. oz.—*University.*

Tincture of Catechu, 4; Chalk Mixture, *q.s.* to produce 100.—*B.P.C. Supplement.*

MISTURA HÆMATOXYLI CUM CATECHU.—Tincture of Catechu, 40 minims; Diluted Sulphuric Acid, 15 minims; Decoction of Logwood, to 1 fl. oz.—*St. Thomas's.*

This formula has been incorporated in the *B.P.C.*, using Aromatic Sulphuric Acid.

Not Official.

CATECHU NIGRUM.

BLACK CATECHU.

A dried extract from the wood of *Acacia Catechu*, Willd. It is also known as **Pegu Catechu** and **Cutch**. It generally occurs in irregularly shaped blackish-brown masses, astringent, and bitter in taste. The *Ind.* and *Col. Add.* put the limit of ash at 6 p.c.

Solubility.—About 80 to 90 p.c. is dissolved by cold Water, the solution being very turbid. The *Ind.* and *Col. Add.* requires not less than 80 p.c. to be soluble in Alcohol (90 p.c.).

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Official in the *Ind.* and *Col. Add.* for India, Eastern Colonies and North American Colonies, within which it may be used in making the *B.P.* preparations for which Catechu is ordered.

Foreign Pharmacopœias.—Official in Austr., Belg., Fr. (Cachou de Pégu), Ger., Ital., Jap., Mex., Port. (Cato), Russ., Span. and Swiss, U.S. **Ourouparia Gambir.** Not in the others.

Tests.—The aqueous solution is acid in reaction towards blue Litmus paper, and yields a green coloration with Ferric Chloride Test-solution, the colour changing to purple on the addition of Sodium Hydroxide Solution. About 80 to 90 p.c. should be dissolved by cold Water, and in boiling Water it should be almost completely soluble. The matter insoluble in Alcohol (90 p.c.) should not amount to more than 20 p.c. The *P.G.* states that the residue insoluble in Water, after washing with hot Water, shall when dried at 100° C. (212° F.) not amount to more than 15 p.c. The ash should not amount to more than 6 p.c. Two samples examined in the author's laboratory left 4·2 p.c. and 5·0 p.c. of ash.

Not Official.

CAULOPHYLLUM.

BLUE COHOSH.

The Rhizome and Roots of *Caulophyllum thalictroides*, Mich.

Descriptive Notes.—The rhizome is of a greyish-brown colour, knotty, 3 to 4 inches (7·5 to 10 cm.) long and $\frac{1}{4}$ to $\frac{1}{3}$ inch (6 to 8 mm.) in diameter, with few branches, and broad concave stem scars at short intervals, the internodes being marked with transverse rings about $\frac{1}{16}$ to $\frac{1}{8}$ inch (1·5 to 3 mm.) apart, and is furnished with matted undulated rootlets about 4 inches (10 cm.) long and 1 mm. broad. The transverse section is whitish and often porous. The bark is thin, the woody wedges short, the medullary rays broad, and the pith large. The rootlets have a relatively thicker bark, and a tough woody centre. It contains starch. It is almost free from odour, and has a sweetish bitter and somewhat acrid taste. The distinctive microscopic characters are the small, spherical, simple starch granules, the large and small porous vessels and the tracheids.

Caulophyllum contains a body analogous to Saponin, and termed for distinction Leontin, and a colourless, odourless, and tasteless, non-crystalline alkaloid, Caulophylline, which is soluble in Water, Alcohol (90 p.c.), Ether and Chloroform, and which on treatment with Hydrochloric Acid is converted into a crystalline salt, **Caulophylline Hydrochloride.**

Caulophyllin, an eclectic remedy in the form of a brown powder, has been recommended as an emmenagogue, sedative and diuretic. Also employed with success as an anthelmintic. Given in the form of a 1 in 20 decoction or infusion, or as a 1 in 5 tincture. Best given in form of a pill.

Dose.—1 to 4 grains = 0·06 to 0·26 gramme. Of the decoction or infusion, 1 to 2 fl. oz. = 28·4 to 56·8 c.c. Of the tincture, 1 to 2 fl. drm. = 3·6 to 7·2 c.c.

A **fluid extract** (1 in 1) and a **compound fluid extract** are also given in doses of 30 to 60 minims.

FLUIDEXTRACTUM CAULOPHYLLI.—1000 grammes of Caulophyllum, in No. 60 powder, exhausted by percolation with Alcohol (70 p.c.) to produce 1000 c.c. of fluid extract.

This was incorporated in the *B.P.C.* employing Alcohol (60 p.c.), but was changed in the *B.P.C. Supplement* to Alcohol (70 p.c.).

LIQUOR CAULOPHYLLI ET PULSATILLÆ (*Ph. Form.*).—Caulophyllum root (Blue Cohosh), 10 oz.; Pulsatilla, 10 oz.; Rectified Spirit, a sufficiency; Water, a sufficiency. Macerate the coarsely-ground drugs in 60 oz. of Rectified Spirit for forty-eight hours and transfer to a percolator. Reserve the first 12 oz. of percolate and continue percolation with 60 oz. of Water. Recover the spirit from this percolate and evaporate to 8 oz. Mix this with the reserved portion, acidify with dilute Sulphuric Acid 30 minims ($\frac{1}{16}$ fl. oz.), set aside for a day, and filter.

This formula has been incorporated in the *B.P.C.*, but the formula has been altered in the *B.P.C. Supplement* to Liquid Extract of Caulophyllum, 25; Liquid Extract of Pulsatilla, 5; Glycerin, 15; Alcohol (60 p.c.), *q.s.* to make 100.

A formula is also inserted in the *Supplement* for Liquor Caulophylli et Pulsatillæ Compositus.

CERA FLAVA.

YELLOW BEESWAX.

Fr., Cire Jaune; Ger., Gelbes Wachs; Ital., Cera Gialla; Span., Cera Amarilla.

A hard, yellow, or yellowish-brown, waxy solid, formed by the Hive-Bee, *Apis mellifica*, L.

When quite fresh, is of a golden yellow, but on keeping gets darker.

Solubility. Entirely in Oil of Turpentine, insoluble in Alcohol (90 p.c.); slightly, and not uniformly, soluble in (cold) Ether; about 1 in 100 of boiling Alcohol (90 p.c.); 1 in 10 of boiling Ether.

Medicinal Properties.—Chiefly used in medicine as an ingredient of plasters and ointments, and is preferable to white Beeswax as the ointments made with the yellow keep a longer time without becoming rancid.

Official Preparation.—Cera Alba. Used in the preparation of Emplastrum Calefaciens, Emplastrum Cantharidis, Unguentum Menthol, Emplastrum Picis, Unguentum Hydrargyri Compositum, Unguentum Picis Liquidæ, Unguentum Resinæ and Unguentum Staphisagriæ.

Not Official.—Aseptic Wax.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex. (Cera Amarilla), Norw., Port. (Cera Amarella), Russ., Span., Swed., Swiss and U.S.

Descriptive Notes.—Yellow Beeswax is imported from many parts of the world, and as it is not in all cases produced by *Apis mellifica*, but by other species in Africa and India, it might become a legal question whether any Beeswax except that of *Apis mellifica* is intended by the Pharmacopœial description. This difficulty might have been avoided by the addition of the words 'or other species.' The wax imported from East Africa often shows a minutely crystalline surface which appears to be characteristic of it.

The value of Beeswax depends on its purity. Owing to the use of artificial foundations for the honeycomb being supplied in the beehives, containing a certain percentage of Paraffin wax, Paraffin is often found in Beeswax as an impurity. Some Beeswax is very impure and dark in colour, due to imperfect straining, and it is also sometimes deficient in odour.

Tests.—The distinguishing tests for Beeswax are that it has a specific gravity of about 0·960; the *B.P.* gives 0·960 to 0·970; the *U.S.P.* 0·951 to 0·960 at 25° C. (77° F.); the *P.G.* 0·962 to 0·966; the method adopted by the latter Pharmacopœia for ascertaining the specific gravity being given in the small type below; a melting point of 61° to 64° C. (141·8° to 147·2° F.); the *U.S.P.* gives 62° to 64° C. (143·6° to 147·2° F.); the *P.G.* 63° to 64° C. (145·4° to 147·2° F.); the method adopted by the *B.P.* for the determination of the melting point being given in the small type below under that heading; and a solidifying point of 58° to 61° C. (136·4° to 141·8° F.). It is officially required to possess an Acid value of not less than 17·8, an Ester value of from 69·08 to 75·76, and a Saponification value of from 86·88 to 93·56. The *U.S.P.* gives no Acid or Ester value, but requires a Saponification value of from 90 to 96. The *P.G.* gives an Acid value of from 18·5 to 24·15, an Ester value of from 73·0 to 75·8, and a Saponification value of from 94·3 to 97·15. The inclusion of an Iodine absorption figure would have been an advantage, genuine Beeswax absorbing from 8 to 9 p.c. of Iodine. The methods adopted by the various Pharmacopœias for the determination of the Acid, Ester and Saponification values are given below in small type. Samples examined in the author's laboratory showed

Acid values ranging from 20·0 to 22, with an average of 21·2; Ester values from 68 to 77, with an average of 72·6; Saponification values of 88 to 99, with an average of 91·3; and a fairly constant Iodine value of 8·9 p.c.

The more generally occurring adulterants are Paraffin or Ceresin Wax; Fatty Acids and Tallow; Japan Wax and Resin; Soap; Starch; and insoluble matter. The solubility of the Wax in Water detects the presence of Soap, and the solubility in boiling Sodium Hydroxide Solution detects acids, *e.g.*, Stearic Acid, Tallow, Japan Wax, and Resin. The resulting solutions should neither be turbid nor when acidified with Hydrochloric Acid should they yield precipitates. Paraffin and Ceresin Wax are detected by heating the Wax with 5 times its weight of Sulphuric Acid for 15 minutes and diluting the mixture with Water. The *B.P.* says that no solid, wax-like body should separate; the *U.S.P.* says no notable amount of solid substance 'which cannot be decomposed by Sulphuric Acid on further treatment' should separate. The solubility of the Wax in Oil of Turpentine detects the presence of Starch and mineral matter. The washed residue when treated with boiling Water, cooled, and tested with Iodine solution shall yield no characteristic blue coloration. Stearic Acid and Resin increase the Acid value and decrease the Ester value, Paraffin and Ceresin Wax decrease both the Acid and Ester value, Carnauba Wax decreases the Acid value but has no effect upon the Ester value, Japan Wax has no influence upon the Acid value but increases the Ester value, whilst Tallow and vegetable Wax increase the Ester value. Stearic Acid, Paraffin and Ceresin Wax lower the Iodine absorption, whilst Resin and Tallow increase it.

Specific Gravity.—The *P.G.* gives the following directions for taking the specific gravity. Let 2 parts of Alcohol be mixed with 7 parts of Water and the mixture allowed to stand at 15° C. (59° F.), until all air bubbles have disappeared from it, then let a small ball of yellow wax be introduced into it. This wax should float on the liquid or at least be suspended when the specific gravity of the diluted Alcohol has been brought to from 0·962 to 0·966 by the addition of Water. The ball of Beeswax requisite for this should be prepared as follows: Let the wax be melted at as low a temperature as possible and allowed to fall drop by drop into a beaker containing Alcohol. Before the fully-rounded mass so obtained is used for the determination of the specific gravity it should remain in the air for twenty-four hours, *P.G.*

Melting Point.—The *B.P.* method is to draw up into a capillary tube of 1 mm. internal diameter some of the melted wax, and allow it to cool for three hours before taking the melting point. The tube is fitted to the bulb of a thermometer and both are immersed in Water contained in a glass vessel, which must be heated gradually until the wax liquefies.

Sodium Hydroxide.—The *U.S.P.* gives the following test: If 1 gramme of yellow wax be boiled for half an hour with 35 c.c. of an aqueous solution of Sodium Hydroxide (1 in 7), the volume being preserved by the occasional addition of Water, the wax should separate on cooling without rendering the liquid opaque, and no precipitate should be produced in the liquid after filtration through glass-wool or asbestos on the addition of Hydrochloric Acid (absence of fats, fatty acids, Japan Wax, and Resin). This test is also given in the *B.P.*, but no quantities are stated. In the *P.G.* test 1 gramme of Yellow Wax is boiled with 10 c.c. of Water and 3 grammes of Sodium Carbonate. The Wax should separate out over the saline solution on cooling, and the solution should be rendered not more than opalescent.

Hydrochloric Acid.—Hydrochloric Acid should not produce a precipitate in Water which has been boiled with a portion of Yellow Wax, *U.S.P.* and *B.P.*, but the latter does not specify boiling Water.

Litmus.—If 1 gramme of Yellow Wax be boiled for a few minutes with 20 c.c. of Alcohol and filtered after an hour, the cooled almost colourless liquid should neither redden blue Litmus paper nor after adding Water to it should it become strongly turbid, *P.G.*

Acid Value.—5 grammes of Beeswax require for neutralisation of the acids not less than 1·6 c.c. of Normal Volumetric Alcoholic Solution of Potassium Hydroxide, using Phenolphthalein Solution as an indicator, *B.P.*; the *P.G.* directs the use of 5 grammes of the Beeswax, 50 c.c. of Alcohol, and after the addition of 20 drops of Phenolphthalein Solution, titration with Semi-normal Volumetric Alcoholic Potassium Hydroxide Solution, of which from 3·3 to 4·3 c.c. should be necessary for neutralisation.

Ester Value.—To the residual mixture left after the *B.P.* determination of the Acid value, a measured quantity of 20 c.c. of Normal Volumetric Alcoholic Potassium Hydroxide Solution is added, and the mixture saponified under a reflux condenser for one hour, the excess being titrated with Normal Volumetric Sulphuric Acid Solution, for which from 13·2 to 13·8 c.c. should be necessary, indicating that not less than 6·2 nor more than 6·8 c.c. has been absorbed by the Beeswax. In the *P.G.* test, after the further addition of 20 c.c. of Semi-normal Potassium Hydroxide Solution to the residue from the Acid value determination the mixture is warmed for half an hour on a water-bath, and the excess alkali is then titrated with Semi-normal Volumetric Solution of Hydrochloric Acid, when from 6·5 to 7 c.c. of the acid should be necessary for the neutralisation of the uncombined alkali.

Sulphuric Acid.—If 5 grammes of Beeswax are heated with 25 c.c. of Sulphuric Acid for 15 minutes to 160° C. (320° F.), and the mixture diluted with Water, no solid wax-like body should separate, *U.S.P.*; *B.P.* uses 25 grammes.

Saponification Value.—Yellow Wax saponified by Alcoholic Potassium Hydroxide T.S. should show a Saponification value of 90 to 96, these figures representing the number of milligrammes of Potassium Hydroxide required to saponify one gramme of Wax, *U.S.P.*

Not Official.

ASEPTIC WAX.—Beeswax, 87; Almond Oil, 12; Salicylic Acid, 1. Melt the Beeswax and Oil, strain through muslin, add the Salicylic Acid, heat to 150° C. (300° F.) in an oil-bath; allow to cool slightly, pour into stoppered bottles, which have been sterilised, and when cold add to each bottle sufficient aqueous solution of Mercuric Chloride (1 in 500) to cover the Beeswax.

This Wax is made by us for Sir Victor Horsley, who uses it for arresting hæmorrhage from cranial bones, by smearing it over the bleeding surface. Put up in wide-mouthed stoppered bottles under aseptic conditions.

This formula has been incorporated in the *B.P.C.*

CERA ALBA.

WHITE BEESWAX.

Fr., Cire Blanche; Ger., Weisses Wachs; Ital., Cera Bianca; Span., Cera Blanca.

A white, or almost white, waxy, somewhat translucent solid, or in thin circular white cakes, obtained by air-bleaching yellow Beeswax.

Official Preparations.—Contained in Pilula Phosphori, Suppositoria Acidi Carbolici, Unguentum Aquæ Rosæ, and Unguentum Cetacei.

Not Official.—Ceratum, Unguentum Simplex.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Norw., Port. (Cera Branca), Mex., Russ., Span., Swed., Swiss and U.S.

Descriptive Notes.—The White Beeswax of the *B.P.* should consist of English, or at least of European Beeswax, since it is Yellow Beeswax made by the *Apis mellifica*, Linn., which has been bleached by exposure to moisture, air and light. The Beeswax sold in commerce in blocks under the name of Dentists' Wax is the purest obtainable, but usually has a faint yellowish tinge. That in flat circular cakes commonly contains 1 to 2 p.c. of Paraffin Wax, which is probably due to the fact that foundations made with Paraffin are laid down in hives for the bees to build upon.

Tests.—Officially it is required to correspond to the tests for Yellow Beeswax, but during the process of bleaching by chemical means changes occur in the composition of the Wax which cause an alteration in the physical constants. It has a specific gravity of 0·960 to 0·970; a melting point of 62° to 64° C. (143·6° to 147·2° F.); an Acid value from 19 to 23; an Ester value from 74 to 84; a Saponification value from 93 to 107; and an Iodine absorption 1 to 10 p.c.

Samples examined in the author's laboratory gave Acid values ranging from 11·8 to 24·6, with an average of 15·7; Ester values ranging from 71·7 to 100·8, with an average of 92; Saponification values ranging from 96 to 114·8, with an average of 107·7; the Iodine values ranged from 2·5 to 7·6, with an average of 5·5.

The more generally occurring adulterants are those mentioned under Cera Flava, and the same methods as there described may be employed for their detection.

Not Official.

CERATUM (U.S.).—White Wax, 6; White Petrolatum, 4; Benzoinated Lard, 10; melt until the mixture is liquefied, and stir it constantly until it congeals. For use in southern latitudes, and during the heated season in other localities 1 of Benzoinated Lard may be replaced by an equal quantity of White Wax.

UNGUENTUM SIMPLEX.—Formerly Official in *B.P.*, but now omitted.

Foreign Pharmacopœias.—Official in Austr. and Hung., Lard 8, White Wax 2; Belg., Lanolin 5, Vaseline 5; Dutch, yellow Wax 3, Sesame Oil 7; Mex., White Wax 1, Sesame Oil 3; Swiss, White Wax 30, Olive Oil 70, Ethereal Tincture of Benzoin 10; U.S. Benzoated Lard 8, Yellow Wax 2; Ger. (Unguentum Cereum), Olive Oil 7, Yellow Wax 3; Jap., Yellow Wax 1, Sesame Oil 2; Port. (Ceroto Simples), White Wax 3, Almond Oil 7; Span. (Cerato Simple), White Wax 1, Almond Oil 3; Swed. (Ceratum), White Wax 1, Spermaceti 1, Benzoated Lard 3; Norw. (Ung. Ceræ), and Russ. (Ung. Cereum), Olive Oil 3, Yellow Wax 1.

CERII OXALAS.

CERIUM OXALATE.

$Ce_2(C_2O_4)_3$, $10H_2O$, eq. 719·22.

A white, or almost white, odourless and tasteless granular powder. Officially it is stated to be prepared by the decomposition of a soluble salt of Cerium with a soluble Oxalate. It has been prepared from the minerals Cerite and Thorite, but is now more generally obtained from Monazite. It consists principally of Cerium Oxalate. Commercial samples usually contain the Oxalates of Lanthanum and Didymium and of other rare earths of this group.

It has been pointed out (*C.D.* '00, i. 992) that the formula should show 10 molecules of Water of crystallisation, and not 9 as in the official formula, and that pure Cerium Oxalate free from Didymium yields a pure yellow, and not a brownish-red residue on ignition.

In spite of two references to this point in Pharmacopœia Committee Reports it is interesting to note that the *B.P.C.* still retains the $9H_2O$ formula.

Solubility.—Insoluble in Water, Alcohol (90 p.c.) and in Ether. Insoluble in cold, but decomposed by boiling Potassium or Sodium Hydroxide Solutions. Insoluble in cold, but soluble in hot, diluted Sulphuric or Hydrochloric Acid.

Medicinal Properties.—Gastric sedative. Given in chronic vomiting, and vomiting during pregnancy, and of phthisis; also in dyspepsia, gastrodynia, and pyrosis. It has been recommended in sea-sickness, in doses of 10 to 20 grains every three hours. Given with success in spasmodic cough of gastric origin.

Cerium Oxalate in the gastric crisis of Tabes.—*L.* '96, ii. 551.

Dose.—2 to 10 grains = 0·13 to 0·65 gramme.

Prescribing Notes.—*It is taken in* 5 *to* 15 *grain doses as a powder mixed with a little Water; also given in* **cachets.** *It is also supplied in effervescent granules, containing* 1, 2, 3 *and* 5 *grains in each drachm.*

Foreign Pharmacopœias.—Official in Jap., Mex. and Port. (Oxalato de Cerio); U.S. Not in the others.

Tests.—The distinguishing tests for Cerium Oxalate are that at a dull red heat it is decomposed, leaving a reddish-brown powder, which is completely soluble in boiling Hydrochloric Acid, the solution yielding on the addition of a saturated Potassium Sulphate solution a white crystalline precipitate; Potassium or Sodium Hydroxide Solution yields a white precipitate which gradually turns yellow on contact with the air, and which does not dissolve in an excess of the reagent; whilst Ammonium Carbonate Solution yields a white precipitate more or less soluble in an excess of the reagent. In carrying out the test with Potassium Sulphate Solution the *U.S.P.* uses the salt itself and not the residue left on ignition; dissolves in Sulphuric Acid instead of Hydrochloric Acid, and uses a 1 in 10 Potassium Sulphate Solution in the place of a saturated solution. The *B.P.* makes no mention of the precipitates produced by Potassium or Sodium Hydroxide Solution.

It is officially required to lose 53 p.c. in weight when incinerated, but no direct indication is given of the composition of the ash. According to the *U.S.P.* it should leave a reddish-brown residue of Ceric and other rare earth oxides, amounting to not less than 47 p.c. of the salt. *B.P.* omits to mention that it should yield the 'reactions characteristic of Oxalates.' Their presence may be detected on decomposing the salt by boiling with Potassium or Sodium Hydroxide

Solution, adding a slight excess of Acetic Acid to the filtrate and then Calcium Chloride Solution; a white precipitate insoluble in Acetic Acid but soluble in Hydrochloric Acid should be produced.

The more generally occurring impurities are Arsenic, Iron, Zinc, Calcium, Aluminium, Carbonates or Phosphates. These impurities are grouped collectively in the *B.P.* The more important are Arsenic, which may be detected by the modified Gutzeit's test, and Zinc, which may be detected by first boiling the salt with Potassium or Sodium Hydroxide Solution, cooling, filtering and adding Hydrogen Sulphide Solution to the filtrate. If this filtrate be previously divided into two portions, the second portion may be used in testing for Aluminium, which is precipitated on the addition of Ammonium Chloride Solution.

Iron may be detected by the addition of Potassium Ferrocyanide Solution to a solution of the salt in diluted Hydrochloric Acid. The *U.S.P.* regards the absence of effervescence when the salt is dissolved in diluted Hydrochloric Acid as indicative of the absence of Carbonates, a test preferable to that of the *B.P.*, which requires that the reddish-brown powder remaining after decomposition at a dull red heat shall dissolve without effervescence in 'boiling Hydrochloric Acid.' Calcium and Phosphates are unlikely impurities and are not included in the *U.S.P.* Cerium Oxalate is not official in the *P.G.*

Calcium Chloride.—If the filtrate from the residue obtained by boiling the salt with Potassium Hydroxide T.S. be supersaturated with Acetic Acid, the addition of Calcium Chloride T.S. will produce a white precipitate insoluble in Acetic Acid, but soluble in Hydrochloric Acid, *U.S.P.*

Ammonium Carbonate.—The solution in Hydrochloric or Sulphuric Acids yields with Ammonium Carbonate T.S. a white precipitate of Cerous and other rare earth carbonates, which are somewhat soluble in excess of the reagent, *U.S.P.*

Strychnine.—If the residue left after heating Cerium Oxalate be dissolved in concentrated Sulphuric Acid, and a small crystal of Strychnine added, a deep blue colour will appear which will rapidly change to purple and then to red, *U.S.P.*

Time-limit Test.—The Solution (1–20) in Diluted Hydrochloric Acid should not respond to the time-limit test for heavy metals, omitting the addition of Ammonia Water, *U.S.P.*

Gutzeit's Test.—Five c.c. of a solution of the salt (1–10) in Diluted Hydrochloric Acid should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Ammonium Chloride.—On boiling the salt with T.S. of Potassium Hydroxide, and filtering, no precipitate should be produced in the filtrate by the addition of T.S. of Ammonium Chloride, *U.S.P.*

Ammonium Sulphide.—The filtrate obtained on boiling the salt with T.S. of Potassium Hydroxide, and filtering, should not yield a precipitate with T.S. of Ammonium Sulphide, *U.S.P.*

CETACEUM.

SPERMACETI.

FR., BLANC DE BALEINE; GER., WALRAT; ITAL., CETINA;
SPAN., ESPERMA DE BALLENA.

White, odourless, somewhat translucent, crystalline, pearly masses, unctuous to the touch, and having a bland mild taste. It is a peculiar, concrete, fatty substance obtained from the Sperm Whale, *Physeter macrocephalus*, L., occurring chiefly in a cavity in the head, but also obtained from smaller cavities in the body.

The Sperm Whale inhabits the Pacific and Indian Oceans.

Cetin or Cetyl Palmitate when saponified yields Ethal (Cetyl Hydrate), and not Glycerin (Glyceryl Hydrate). Most Oils and Fats are Oleates, Palmitates, and Stearates of Glyceryl, which when saponified yield Glycerin and Oleates, Palmitates and Stearates of the metals.

Solubility.—Slightly in Alcohol (90 p.c.); 1 in 80 of boiling Alcohol (90 p.c.); 1 in 6 of Ether; 4 in 5 of Chloroform; and in the fixed and volatile Oils.

Medicinal Properties.—Emollient. It is much employed for **ointments** and **cerates.**

Spermaceti can be powdered quite readily with the addition of Alcohol (90 p.c.), but when Alcohol is contra-indicated it can also be powdered by the addition of 12 minims of fixed Oil of Almonds to each oz. of Spermaceti.

Official Preparations.—Unguentum Cetacei. Contained in Unguentum Aquæ Rosæ and Unguentum Capsici.

Not Official.—Mistura Cetacei, Cold Cream, Unguentum Cetacei sine Benzoino.

Foreign Pharmacopœias.—Official in all except Belg. Mex. (Esperma); Port. (Espermaceti).

Descriptive Notes.—Spermaceti is deposited from Sperm Oil, which is found in cavities of the head of the Sperm Whale, *Physeter macrocephalus*, L. The oil is cooled, the Spermaceti separated by straining, and pressed in bags to remove adhering oil, until hard and brittle. It is then melted in boiling Water to which a weak solution of Potash is added to remove impurities, washed and crystallised. The crystalline masses in which it occurs in commerce are quite characteristic in appearance. Chinese insect wax, which is but rarely imported, closely resembles it, but is much harder. It is a wax secreted by *Coccus Pela*, Westw., in China, on the twigs of Chinese species of Ash and Privet, and is used by the Chinese to form an outer layer on candles to prevent guttering. It has a much higher melting point than Spermaceti.

Tests.—The distinguishing tests for Cetaceum are the melting point, which should be about 48° C. (118·4° F.) and which is officially required to be from 46° to 50° C. (114·8° to 122° F.), but which is occasionally as low as 43° C. (109·4° F.), and the specific gravity, which should be from 0·942 to 0·946, and to which no reference is made in the *B.P.* The *U.S.P.* gives the melting point as 42° to 50° C. (107·6° to 122° F.); the *P.G.* 45° to 50° C. (113° to 122° F.). The *B.P.* adopts the same method for taking the melting point of Cetaceum as for Cera Flava. The *U.S.P.* gives the specific gravity as 0·935 to 0·944 at 25° C. (77° F.), 0·842 at 100° C. (212° F.); the *P.G.* gives an average specific gravity of 0·943. It should possess an Acid value of from 0·1 to 0·5, and a Saponification value of from 125 to 136. The *B.P.* places the limit of acidity at not more than 'one drop' of Normal Volumetric Sodium Hydroxide Solution for the neutralisation of the alcoholic solution of 0·2 gramme of Spermaceti, using Phenolphthalein Solution as indicator, but gives no figure for the Ester value. The quantity (0·2 gramme) used in the official method of determination is too small, and it is preferable to employ from 1 to 5 grammes. The limit of acidity indicates an Acid value of 13·9, and is altogether too high even for old samples, The Acid value increases greatly with age. A sample examined in the author's laboratory in November, 1896, showed the merest trace of free acid, but when re-examined in July, 1901, exhibited an Acid value of 4·5. The Iodine absorption of pure Spermaceti is practically nil.

The more generally occurring sophistications are Stearic and Palmitic Acids, Stearin, Tallow, and Paraffin Wax. Stearin and Palmitic Acid may be detected by the reaction of the alcoholic solution towards Litmus and by the precipitate produced on dilution of the solution with Water. The *U.S.P.* and *P.G.* boil with anhydrous Sodium Carbonate and Alcohol, subsequently acidifying the solution with Acetic Acid, and state that the solution may become turbid, but should not give a precipitate. The solubility in boiling Alcohol (90 p.c.) detects the presence of Stearin, Tallow, and Paraffin Wax. Tallow and Stearin increase and Paraffin Wax diminishes the saponification value. The presence of Tallow may also be recognised by the increased Iodine absorption. Paraffin Wax notably diminishes the specific gravity.

Alcohol.—If Spermaceti be boiled with Alcohol (90 p.c.), and the mixture cooled and filtered, the filtrate should not afford a flocculent precipitate on the addition of Water, *B.P.* (an equal quantity of Water), *P.G.* At ordinary temperatures Cetaceum gradually crystallises out from a solution in boiling Alcohol (90 p.c.), which is approximately 1 in 50, *P.G.*

Acetic Acid.—If 1 gramme of Cetaceum be boiled with 1 gramme of anhydrous Sodium Carbonate and 50 c.c. of Alcohol, and the mixture cooled and filtered, the filtrate on being supersaturated with Acetic Acid may become turbid, but it should not afford a precipitate, *P.G.* and *U.S.P.*

Preparations.

UNGUENTUM CETACEI. SPERMACETI OINTMENT.

Spermaceti, 5; White Beeswax, 2; Almond Oil (by weight), 18; Benzoin, in coarse powder, ½. Melt together the Spermaceti, Beeswax, and Almond Oil; add the Benzoin, and frequently stirring the mixture, continue the application of heat for two hours; remove from the source of heat; strain; and stir the Ointment constantly until cold.

It would be better to omit the Benzoin, which was first added in 1885; as pointed out in previous editions, the Benzoin converts this emollient preparation into one which is irritating: *see* below.

The following are called **Unguentum Cetacei**—(all by weight):—
Dan. Spermaceti 2, White Wax 1, Oil of Almonds 12, Rose Water 5.
Norw. Spermaceti 6, White Wax 6, Oil of Almonds 58, Rose Water 30.
Russ. Spermaceti 3, White Wax 3, Olive Oil 14, Rose Water 2.
Swed. Spermaceti 2, White Wax 1, Oil of Almonds 12, Rose Water 5.
Swiss. Spermaceti 2, White Wax 1, Arachis Oil 7, Ethereal Tincture of Benzoin, 1.

The following are called **Ceratum Cetacei**—(all by weight):—

Austr. Spermaceti, White Wax, Sesame Oil, equal parts.
Hung. Spermaceti 8, White Wax 8, Lard 9.
Port. Spermaceti 1, White Wax 1, Oil of Almonds 3.
Span. Spermaceti 4, White Wax 4, Oil of Almonds 47, Rose Water 45.
U.S. See **Unguentum Aquæ Rosæ.**

Cold Cream is a synonym for Unguentum Cetacei, *Dan.* and *Swed.*, and Unguentum Leniens, *Belg.* and *Ger.*

The following are called **Unguentum Leniens**—(all by weight):—

Austr. Spermaceti 15, White Wax 8, Sesame Oil 62, Water 15, Otto of Rose 2 drops.
Belg. White Wax 14, Almond Oil 56, Rose Water 30.
Dutch. Spermaceti 10, Yellow Wax 5, Adeps Lanæ 10, Sesame Oil 50, Rose Water 25.
Ger. Spermaceti 8, White Wax 7, Almond Oil 57, Water 28, Otto of Rose 0·1.

Unguentum Refrigerans—(all by weight):—

Swiss. Spermaceti 10, White Wax 8, Arachis Oil 57, Castor Oil 5, Otto of Rose 1 drop, Rose Water 20.
Pomata con Olio di Mandorle:—*Ital.* Spermaceti 1, White Wax 1, Oil of Almonds (by weight) 8.
Cerato de Galeno:—*Span.* Almond Oil 55, White Wax 15, Agua de Rosas 30.

Not Official.

UNGUENTUM CETACEI SINE BENZOINO.—Spermaceti 5, White Beeswax 2, Almond Oil 18.

The *B.P.* ointment made with Benzoin is unsuited for many purposes for which this ointment is useful, such as **eye** ointments, ointment for piles, etc.

Used as a cooling dressing. Applied on lint to broken blisters resulting from walking, it affords great relief, and frequently enables one to continue the exercise without serious discomfort. It is also recommended for smearing on the feet before starting for a long walk on rough ground.

MISTURA CETACEI.—Spermaceti 60 grains, Proof Spirit 15 minims, finely pulverise the Spermaceti by aid of the Spirit, and add by degrees half the yolk of an egg, at first only sufficient to make a stiff paste, which should be made very smooth by diligent trituration, then add the rest, and make up with Water to 4 oz.

[This formula was given in Squire's *Companion* 1864.]

COLD CREAM.—White Beeswax, 1; Spermaceti, 1; Oil of Almonds, 8; Rose Water, 11; Otto of Rose to perfume it. Melt together, by means of water-bath, the Oil, Spermaceti, and Beeswax, add the Otto, strain through muslin into the Rose Water; stir together whilst gently warming until Water globules are no longer visible, and the mixture is of proper consistence to pour into pots without separating. This form has been used by the author for several years, but Cold Cream is more easily and more generally made with less Rose Water. *See* also Unguentum Aquæ Rosæ under Rosæ Oleum.

Cold Cream.—Spermaceti, 60; White Wax, 30; Almond Oil, 215; Rose Water, 60; Tincture of Benzoin, 15; Otto of Rose, 10 drops.—*Fr.*

Not Official.

CETRARIA.

ICELAND MOSS.

The dried Lichen, *Cetraria Islandica*, L. A native of the north of Europe.

It contains a bitter principle, **Cetrarin** (Cetraric Acid), which has been used as a tonic.

Medicinal Properties.—Demulcent, nutritious, and slightly tonic.

Iceland Moss Jujubes are useful for coughs.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Fr. (Lichen d'Islande), Ger., Hung., Ital., Jap., Port., Span. (Liquen Islandico), and Swiss, *Lichen Islandicus*; Mex. (Liquen de Islandia). Not in Norw.

Descriptive Notes.—The frond of the lichen, *Cetraria islandica*, L., is more or less branched in a forked manner, of a brownish colour above, and greyish-white below, marked on the under surface with numerous minute scattered chalky-white pits. It is flat, channelled above, and has a crisp mode of growth. The wavy edges are furnished with a fringe of numerous minute short linear papillæ. The fructification, which consists of a flat, disc-like, dark brown expansion near the margin of the frond, is rarely met with, and then mostly on the broader varieties of the plant. The taste is mucilaginous and slightly bitter.

DECOCTUM CETRARIÆ.—Iceland Moss, 1; first wash with cold Water, then add Distilled Water, 20; boil ten minutes, strain with gentle pressure whilst hot and wash the marc to make 20. (1 in 20)

Dose.—1 to 4 fl. oz. = 28·4 to 113·6 grammes.

Official in Ital., 1 in 20; Fr. (Tisane), 1 in 100; Ital. has also **Infusion,** 1 in 20.

SACCHARUM CETRARIÆ.—Iceland Moss 1, Sugar 1, Water 100. Wash the Iceland Moss with Water to remove the bitterness, then boil with 100 of Water, strain and express lightly, and in the strained liquid dissolve the Sugar and evaporate on a water-bath. When sufficiently firm remove from the bath and dry in a cupboard to a powder or scale.

GELATINA CETRARIÆ (Iceland Moss Jelly).—Saccharated Cetraria 2, Sugar 1, Water 5. Mix, boil gently till scum collects on the surface, then withdraw the heat, remove the scum, and pour into pots to cool.

A similar preparation is given in Ital., Port. and Span.

Pâte de Lichen officinal containing 1 of Extract of Opium in 5000.—*Fr.*

Not Official.

CARRAGEEN.

IRISH MOSS. *Syn.*—CHONDRUS.

FR., CARRAGAHEEN; GER., IRLANDISCHES MOOS; ITAL., FUCO CARAGEO;
SPAN., CARRAGAEN.

The dried seaweed *Chondrus crispus*, Lyngb. It is used as an article of food on the west coast of Ireland, where it abounds. Has been proposed as a substitute for Acacia as an emulsifying agent and for the suspension of some powders.

One part of Chondrus boiled for ten minutes with 30 parts of Water yields a solution which gelatinises on cooling, and is not coloured blue by T.S. of Iodine. —*U.S.P.*

Foreign Pharmacopœias.—Official in Belg., Dan., Dutch, Fr., Ger., Hung., Ital. (Fuco Carageo), Jap., Mex. (Liquen Carragaen), Port. (Alga Perlada), Span. and Swiss. Fr. has a Tisane 1 in 200.

SACCHARUM CARRAGEEN.—Made like Saccharum Cetrariæ.

GELATINA CARRAGEEN (Irish Moss Jelly).—Made like Gelatina Cetrariæ.

Official in Port.

MUCILAGE OF MOSS.—Irish Moss, ½ oz., is boiled with 40 oz. of Water for 15 minutes and made up to 34 oz.—*Armour's Formulary.*

Decoctum Chondri.—Irish Moss, 2·50; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

The *B.P.C. Supplement* gives the *syn.* Mucilage of Irish Moss.

Not Official.

CHALMOOGRA OIL. *See* GYNOCARDIÆ OLEUM.

Not Official.

CHELIDONIUM.

GREATER CELANDINE.

The entire Plant *Chelidonium majus*, L.

The juice has been used in opacities of the cornea, and is a popular application for the cure of warts.—*B.M.J.* '97, i. 25 and 354.

Has been recommended chiefly by Denisenko in the treatment of cancer. *B.M.J.* '97, i. 25, 354 and 637 ; ii. 123 ; *B.M.J.E.* '96, ii. 88 ; '97 ii. 47 ; *L.* '96, ii., 649 and 1778 ; *L.* '97, ii. 737 ; *P.J.* '97, i. 86. Unfavourably commented on *P.J.* '98, i. 61. In the treatment of inoperable cancer, Celandine is worthy of trial.—*L.* '01, ii. 967 ; *C.D.* '01, ii. 1048.

Chelidonine.—This alkaloid forms colourless crystals, melting at 135° C. (275° F.); soluble in Alcohol (90 p.c.), insoluble in Water, and but slightly soluble in Ether.

Dose.—1 to 3 grains = 0·06 to 0·2 gramme.

The **Sulphate** is readily soluble in Water, the **Hydrochloride** less so, and the **Tannate** is insoluble in Water.

CHIRATA.

CHIRETTA.

FR., CHIRETTE ; GER., OSTINDISCHER ENZIAN.

The entire dried Plant, *Swertia Chirata*, Ham., collected when in flower.

It is a native of, and is obtained from, Northern India.

Under the title of **Andrographis,** the dried plant, *Andrographis paniculata*, is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Medicinal Properties.—Bitter tonic and stomachic; without astringency; given in atonic dyspepsia. Containing no Tannin, it may be prescribed with Iron.

Official Preparations.—Infusum Chiratæ, Liquor Chiratæ Concentratus, and Tinctura Chiratæ.

Not Official.—Infusum Chiratæ Concentratum.

Foreign Pharmacopœias.—Official in Port. and U.S. Not in the others.

Descriptive Notes.—The Chirata official in the *B.P.* is distinguished by its very bitter taste, by the opposite, entire, glabrous, ovate leaves, and by the pith being continuous, solid, and easily separable. It is met with in commerce in compact flattened bundles about 3 ft. long and about 5 or 6 in. thick, and weighing 1½ to 2 lb., and bound round with a slip of bamboo. Other allied species are used in different provinces of India, and some of them are occasionally imported and sold as the genuine drug. Of these *Swertia angustifolia*, Buch-Ham., has a more woody, tougher and nearly hollow stem. *S. alata*, Royle, has pale angular stems, with a large pith. These give a much less bitter infusion than genuine Chirata. Sometimes Chirata is falsely packed, Madder roots or other plants, or even stones, being concealed in the centre of the bundle. *Andrographis paniculata*, Nees, has distinctly quadrangular stems and irregular flowers, and only

3 or 4 seeds in each capsule, and is not packed in loose bundles. It is rarely imported and not likely to be confounded with Chirata. It is official in the *Ind.* and *Col. Add.* Under the microscope the leaves may be distinguished from those of Chirata by the presence of cystoliths below the upper epidermis, which are shorter than in most other medicinal Acanthaceous plants, by the stomata being placed between a large and small cell, and by the quadricellular glandular hairs (*Planchon* and *Collin*).

Preparations.

INFUSUM CHIRATÆ.

Chiretta, cut small, 1; boiling Distilled Water, 20: infuse for fifteen minutes; strain. (1 in 20)

Now 1 in 20 instead of 1 in 40.

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.

A corresponding preparation, **Infusum Andrographidis,** is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

LIQUOR CHIRATÆ CONCENTRATUS. CONCENTRATED SOLUTION OF CHIRETTA.

1 of Chiretta, in No. 40 powder, percolated with Alcohol (20 p.c.) to yield 2. (1 in 2)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Tests.—Concentrated solution of Chiretta has a specific gravity of 0·990 to 1·010; it contains about 5 p.c. w/v of total solids and 19 p.c. w/v of Absolute Alcohol.

A corresponding preparation, **Liquor Andrographidis Concentratus,** is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

U.S. has a **Fluid extract,** 1 in 1, using Alcohol 49 p.c.

TINCTURA CHIRATÆ.

1 of Chiretta, in No. 40 powder, percolated with Alcohol (60 p.c.) to yield 10. (1 in 10)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Prescribed in 5 minim doses, with Acids and Tincture of Orange to form an acid tonic mixture.

A corresponding preparation, **Tinctura Andrographidis,** is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Tests.—Tincture of Chiretta has a specific gravity of 0·920 to 0·925, it contains about 1·5 p.c. w/v of total solids and about 60 p.c. w/v of Absolute Alcohol.

Not Official.

INFUSUM CHIRATÆ CONCENTRATUM.—Chiretta, in No. 40 powder, 40; Alcohol (90 p.c.), 25; Dilute Chloroform Water (1 in 1000), sufficient to make 100. Prepare by repercolation.—*Farr* and *Wright*, *P.J.* '06, i. 165 and '07, i. 621; *C.D.* '06, i. 252; *Y.B.P.* 1907, 249.

This formula appears in the *B.P.C.*

CHLORAL HYDRAS.

CHLORAL HYDRATE.

$CCl_3 . CH(OH)_2$, eq. 164·15.

FR., HYDRATE DE CHLORAL; GER., CHLORALUM HYDRATUM; ITAL., CLORALIO IDRATO; SPAN., HIDRATO DE CLORAL.

Transparent, colourless, rhomboidal crystals, having an aromatic penetrating odour, and an unpleasant, slightly bitter, acrid taste.

It should be kept in well-stoppered amber-tinted glass bottles in a cool and dark place.

Chemically it is Trichlorethylidene Glycol. Anhydrous Chloral is produced by the action of dry Chlorine gas on Ethyl Alcohol, the pure Chloral being subsequently converted into Hydrate by the addition of the necessary amount of Water and purified by recrystallisation from suitable solvents.

Solubility.—4 in 1 of Water, and measures 3¼; 5 in 1 of Alcohol (90 p.c.); 2 in 1 of Ether; 2 in 1 of Glycerin; 1 in 1 of Olive Oil; 1 in 3 of Chloroform; 1 in 10 of Oil of Turpentine (cold), 1 in 5 boiling; 1 in 68 of Carbon Bisulphide.

Medicinal Properties.—An excellent hypnotic, producing natural and placid sleep soon after its administration; in acute mania and delirium tremens it is given as a cerebral depressant. Given in asthma and whooping-cough, and extreme cases of chorea; efficacious in large doses in sea-sickness. Has been found useful as a spinal depressant and antispasmodic in tetanus, uræmic and puerperal convulsions, and by intravenous injection in Strychnine poisoning. Of great value in labour, as it relieves pain, assists to dilate the os and relax the rigid perinæum, especially in primiparæ, without lessening the expulsive power of the uterus. Given in nocturnal incontinence of urine. It should not be given in advanced cardiac disease, nor in fatty heart. Children stand it well.

It is not suitable for insomnia due to pain; as an analgesic it is inferior to opium.

In concentrated solution, applied locally, it acts as a vesicant.

As a pigmentum with Camphor and sometimes with Cocaine, it is useful for the relief of neuralgia, rheumatism, toothache and chilblains.

In tetanus in 20 grain doses every five hours (*B.M.J.* '04, ii. 1460), and along with injections of antitetanic serum (*B.M.J.* '04, ii. 1429); in sea-sickness teaspoonful doses every five minutes of a mixture of 2 drm. of the syrup with ½ drm. Ammonium Bromide made up to 1½ oz. with Water; where this fails relief often follows 1 minim doses of Tincture of Iodine.—*B.M.J.* '04, ii. 1405.

The only satisfactory way of giving this drug in obstinate cases of sea-sickness is by the rectum in doses of from 20 to 30 grains.—*B.M.J.* '05, i. 1090.

The tendency to eclampsia may often be controlled (*B.M.J.* '05, ii. 718) by the administration of ½ drm. doses, combined with a drm. of Potassium Bromide and repeated if necessary every hour.

It is shown (*B.M.J.* '05, ii. 250) to be of special use in sleeplessness and pain of gouty people with high blood pressure. It seems a general law (*B.M.J.* '05, ii. 1005) that when a hypnotic contains Chlorine in its molecule its effects are not limited to the brain and central nervous system, but extend to the heart and the tissues in general.

In the treatment of convulsions in early infancy (*Pr.* lxxv. 514), 2 to 3 grains may be given hypodermically or introduced into the bowel through a rubber catheter. For rectal injection 5 grains may be given to a baby of six months and 10 grains to one a year old. One grain every two hours in the youngest babies (*Pr.* lxxv. 517), and in children of one or two months 1 to 2 grains, continued in these doses until the fits have ceased, for at least 24 or 36 hours, in the treatment of idiopathic convulsions.

Effects from an overdose or repeated overdoses are excitement, convulsions, and delirium, followed by deep coma and quiet sleep from which the patient may never stir; he may, however, pass to death without any previous convulsions. It lowers temperature, and causes contraction of the pupil.

A case of puerperal eclampsia treated by Chloral Hydrate, Potassium Bromide, and Chloroform inhalation.—*L.* '97, ii. 915.

As a pigment to the interior of the nostrils in acute coryza, 10 grains in 4 drm. Castor Oil.—*Pr.* lv. 517.

Applied spread over the surface of diachylon plaster, the skin having been previously rubbed over with Almond Oil or Vaseline, it acts as a vesicant, superior to Cantharides.—*P.J.* '02, i. 115.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Ph. Ger. maximum single dose, 3 grammes; maximum daily dose, 6 grammes.

Prescribing Notes.—*3 oz. will dissolve in 1 fl. oz. of Water, and measure 2 fl. oz. and 5½ fl. drm.; if to this be added 23 minims of Water, every minim will contain a grain of Chloral. This* **solution** *is handy for dispensing.*

It is usually given in solution, but the objectionable taste is difficult to mask; Chloral Hydrate, 20 grains, Syrup of Orange, 1 fl. drm., Peppermint Water, to 1 fl. oz., make a good draught for those who do not object to Peppermint.

Chloral Hydrate, 4 grains, Liquorice Root, in powder, 1 grain, Gum Acacia, in powder, ½ grain, make a good **pill**, *with a trace of 'Diluted Glucose.'*

The addition of 1 grain to the fl. oz. will keep hypodermic solutions otherwise liable to develop fungoid growths.

Incompatibles.—When prescribed with Alkalis, Chloroform will be liberated.

Official Preparation.—Syrupus Chloral.

Not Official.—Liquor Bromo-Chloral Compositus, Chloral Camphoratum, Chloral cum Camphora et Cocaina, Chloral et Phenol, Suppositoria Chloral, Dormiol, and Chloral Tannin.

Antidotes.—Stomach-tube or emetics; keep up the temperature by hot blankets, hot-water bottles, etc.; injection of a pint of hot strong coffee into rectum; electro-magnetism; inhalations of Amyl Nitrite; in bad cases hypodermic injection $\frac{1}{25}$ grain of Strychnine Nitrate: artificial respiration.—*Murrell.*

$\frac{1}{20}$ of a grain of Picrotoxin has been found enough for 30 grains of Chloral.—*B.M.J.* '75, i. 506.

Foreign Pharmacopœias.—Official in Austr., Belg., Ger., Hung., Jap., Russ., Swiss and U.S. (Chloralum Hydratum); Dutch (Hydras Chlorali); Dan., Norw. and Swed. (Hydras Chloralicus); Fr., Ital. (Cloralio Idrato); Mex. (Cloral Hidratado); Port. (Hydrato de Chloral); Span. (Hidrato de Cloral).

Tests.—The distinguishing tests for Chloral Hydrate are the melting point of the crystals, which, when dried, should be about 58° C. (136·4° F.); the temperature at which the melted liquid again becomes solid (the solidifying point), which is officially required to be about 48·9° C. (120° F.); and the boiling point (when heated in a test-tube with pieces of glass contained in it), which is officially required to be from 94·4° to 96·7° C. (202° to 206° F.). The *B.P.*

gives no figure for the melting point, but *P.G.* and *U.S.P.* state it to be about 58° C. (136·4° F.) when dry. The *U.S.P.* gives a range of from 35° to 50° C. (95° to 122° F.) for the solidifying point. The best adjusted solidifying point is considered by Squibb to be 50° C. (122° F.). If the sample is too much under-hydrated the solidifying point is higher and the boiling point is under 95° C. (203° F.), and the sample is prone to decompose and become acid on keeping. If over-hydrated the solidifying point is lower and the boiling point is above 98° C. (208·4° F.) and the sample is deliquescent, a slightly under-hydrated sample is the best for good-keeping qualities.

The aqueous solution should be neutral or but slightly acid to Litmus. The *U.S.P.* states that the aqueous solution gradually acquires an acid reaction, but that a neutral alcoholic solution remains permanently neutral.

An aqueous solution warmed with Potassium or Sodium Hydroxide Solution evolves immediately a powerful odour of Chloroform, the Chloral Hydrate being decomposed with formation of Chloroform and the corresponding Formate of the alkali Hydroxide. If to the cooled solution a few drops of Aniline Oil be added, and the liquid again warmed, the powerful, penetrating, and highly poisonous odour of Phenyl-isonitrile is evolved. When heated with an excess of Potassium or Sodium Hydroxide Solution the Chloroform at first formed is itself decomposed with the production of the corresponding Chloride of the alkali and a further quantity of Formate.

The *B.P.* process of quantitative determination is founded upon decomposition by an alkali Hydroxide Solution. It is officially required to indicate 98·5 p.c. of pure Chloral Hydrate as volumetrically determined from the quantity of Normal Volumetric Sodium Hydroxide Solution required to decompose 4 grammes. No requisite percentage or method of determination is given in the *P.G.* The *B.P.* test has been severely criticised. If as in the official method of procedure the Chloral Hydrate be 'heated' with the Normal Volumetric Sodium Hydroxide Solution, results greatly in excess of the truth are yielded, attributable to secondary decomposition of the Chloroform by the excess of alkali. The term 'heated' may be variously understood by different operators. It has been pointed out (*P.J.* '99, i. 236; '01, i. 387; '03, i. 531) that if the reaction be allowed to proceed at the ordinary temperature fairly concordant results may be obtained, but the range of temperature must be restricted within narrow limits. A correction may also be made (*P.J.* '07, ii. 4) by allowing the secondary reaction to commence and ascertaining the extent to which it has proceeded by titration of the resultant Chloride with Deci-normal Volumetric Silver Nitrate Solution.

The *Companion* (17th Edition) suggested determination, when in very dilute solution, by reduction by the Copper-Zinc couple and titration with Deci-normal Volumetric Silver Nitrate Solution. A process described (*P.J.* '07, ii. 6) depends upon the reduction of the Chloral Hydrate by means of Aluminium Powder or Zinc filings and Acetic Acid. A weighed quantity of 0·25 gramme is boiled with 1 gramme of Aluminium Powder, 15 c.c. of Acetic Acid *B.P.*, and

10 c.c. of Water under a reflux condenser for half an hour. The mixture is then filtered, the filter and flask washed with Water, 50 c.c. of Deci-normal Volumetric Silver Nitrate Solution is then added, the Silver Chloride filtered out, and the excess of Volumetric Silver Nitrate Solution determined with Deci-normal Volumetric Ammonium Sulphocyanide Solution, adding 10 c.c. of strong Nitric Acid and 5 c.c. of a saturated Iron Alum solution as indicator. Each c.c. of Deci-normal Volumetric Silver Nitrate Solution used is equivalent to 0·005472 gramme of pure Chloral Hydrate.

Chloral Hydrate may be extracted from its aqueous solution by shaking out with Ether or Acetic Ether.

A simple process for the approximate determination of the amount of Chloroform yielded on treatment with Potassium Hydroxide may be conveniently conducted in a graduated tube, thus: Place in a tube 250 grain-measures of a 20 p.c. Potassium Hydroxide Solution, and add to it gradually (keeping it cold) 50 grains of the Chloral Hydrate, cork securely, and shake; allow the liquid to separate, and the number of grain-measures of Chloroform (at the bottom), to which must be added 1 for every 200 grain-measures of supernatant liquid, multiplied by 1·5 gives the grains of Chloroform, which should be not less than 35.

The more generally occurring impurities are mineral matter, Chloral Alcoholate, certain organic impurities and Chlorides. Mineral residue is readily detected when the drug is volatilised on Platinum foil. The *B.P.* employs the Iodoform test as a means of detecting Chloral Alcoholate. No yellow crystalline precipitate of Iodoform should be produced within an hour, when Iodine Solution, in sufficient quantity to yield a brown coloration, is added to a filtered mixture of 1 gramme of the hydrate warmed with 6 c.c. of Water and 0·5 c.c. of Potassium Hydroxide Solution, *B.P.* Organic impurities may be detected by shaking the chloroformic solution with concentrated Sulphuric Acid, whilst Hydrochloric Acid and Chlorides may be detected by Silver Nitrate Solution, the *B.P.* requires that the aqueous solution should not afford any precipitate with Silver Nitrate Solution, the *U.S.P.* requires that the 1 in 20 aqueous solution, slightly acidulated with Nitric Acid, should remain unaffected by Silver Nitrate T.S.

Sulphuric Acid.—No colour should be imparted to Sulphuric Acid when it is shaken with a solution of Chloral Hydrate in Chloroform, *B.P.* The *P.G.* test directs 0·5 gramme of Chloral Hydrate to be vigorously shaken with 5 c.c. of Sulphuric Acid in a glass-stoppered test-glass of 3 cm. diameter, and which has been previously rinsed out with Sulphuric Acid. The Sulphuric Acid should not become coloured within one hour.

Silver Nitrate.—An alcoholic solution (1–10) of Chloral Hydrate should not be affected at once by T.S. of Silver Nitrate, *P.G.*; that an aqueous solution (1–20) slightly acidulated with Nitric Acid should remain unaffected, *U.S.P.*; an aqueous solution should not afford any precipitate with T.S. of Silver Nitrate, *B.P.*

Preparation.

SYRUPUS CHLORAL. Syrup of Chloral.

Dissolve 800 grains of Chloral Hydrate in 15 fl. drm. of Distilled Water, and add Syrup, *q.s.* to yield 10 fl. oz. (10 grains in 60 minims)

Dose.—½ to 2 fl. drm. = 1·8 to 7·1 c.c.

Foreign Pharmacopœias.—Official in Belg. and Fr., 1 in 20, with Peppermint; Mex., 1 in 20; Port., 1 in 50; Span., 1 in 32·5. All by weight. Not in the others.

Not Official.

LIQUOR BROMO-CHLORAL COMPOSITUS.—Chloral Hydrate, 1600 grains; Tincture of Indian Hemp, 400 minims; Tincture of Orange, 400 minims; Henbane Juice, 1600 minims; Syrup, 3¾ fl. oz.; Fluid Extract of Liquorice, ½ fl. oz.; dissolve. Add 1600 grains of Potassium Bromide dissolved in 7 fl. oz. of Distilled Water; filter, wash with Distilled Water to produce 20 fl. oz. Each fl. drm. contains 10 grains of Chloral Hydrate and 10 grains of Potassium Bromide.

Dose.—½ to 2 fl. drm. = 1·8 to 7·1 c.c.—*B.P.C. Formulary* 1901.

B.P.C. is practically the same strength, but calculated into parts per 100 fluid parts.

Bromidia is somewhat similar in composition.

It has been suggested that each fl. drm. should be made to contain 15 grains each of Chloral and Potassium Bromide, and that the filtration should be omitted, since it takes out the resins of the Indian Hemp. Suspension by mucilage recommended. Hyoscine Hydrobromate recommended to be substituted for Henbane.—*C.D.* '02, ii. 314.

SUPPOSITORIA CHLORAL.—Chloral Hydrate, 5 grains; White Wax, 5 grains; Oil of Theobroma, 7 grains. Melt together the Wax and Theobroma Oil, and when partially cooled, mix in the Chloral Hydrate and pour into a mould.

CHLORAL CAMPHORATUM.—Chloral Hydrate, 1; Camphor, 1; rub together in a warm mortar until completely liquefied, and filter if necessary. —*B.P.C. Formulary* 1901, now incorporated in the *B.P.C.*

As a **Pigmentum** this formula has appeared for many years in the Pharmacopœias of the London, Throat and Westminster Hospitals.

Useful application for the relief of neuralgia.

CHLORAL CAMPHORATUM CUM COCAINA.—Chloral Hydrate, 9; Camphor, 9; Cocaine, 2.

This has been incorporated in the *B.P.C.*

CHLORAL ET PHENOL.—Chloral Hydrate, 1; Carbolic Acid, 1.

Is soluble in Water, Alcohol (90 p.c.), and in Glycerin.

The **Chloral Carbolatum** of *B.P.C.*

So long as the proportion of Carbolic Acid to Chloral does not exceed 1·7 to 1, the product will mix with Water in all proportions; beyond this limit the excess of Carbolic Acid separates on the addition of Water. As it corresponds to 3 molecular weights to 1, there is probably a chemical combination in these proportions.—*P.J.* (3) xvi. 188.

DORMIOL (Amylene Chloral).—A colourless liquid possessing a camphoraceous odour; usually supplied commercially as a **50 p.c. solution** which mixes readily with Water. It is also supplied in capsules containing 0·5 gramme.

A good narcotic in mental diseases, and stated to produce no untoward effects.—*L.* '99, ii. 73; '02, i. 1712; *B.M.J.* '02, i. 1278; *P.J.* '03, i. 62.

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

Prescribing Notes.—*It can be given in capsules, or in mixtures, covering the unpleasant taste with Syrup of Tolu, using equal parts of the Syrup and Water.*

CHLORAL TANNIN (Captol).—A brown, resinous substance, soluble in Water and in Alcohol.

A solution has been introduced as a Hair Wash.

Not Official.

CHLORALAMIDUM.

CHLORALAMIDE. CHLORALFORMAMIDUM, U.S.; CHLORAL FORMAMIDE.

$C_3H_4Cl_3NO_2$, eq. 191·00.

Chloralamide is a compound of Chloral Anhydride and Formamide. Colourless lustrous, odourless crystals, possessing a somewhat bitter taste. Its aqueous solution should not be heated above 48·8° C. (120° F.), as above that temperature in undergoes hydrolysis, being reconverted into Anhydrous Chloral and Formamide. It is permanent in weakly acidulated solutions, but decomposed by alkalis.

It should be preserved in well-stoppered amber-tinted glass bottles.

Care should be taken not to confound Chloralamide with Chloralimide.

Solubility.—1 in 21 of Water; 1 in 2 of Alcohol (90 p.c.); it dissolves very slowly in Glycerin but if sufficient time is allowed, 1 in 12 solution can be obtained, in about 3 days at 60° F.

Published solubilities of it in Water have varied considerably. The *Companion* figure (1890) as above has been confirmed (*P.J.* (3) xxii. 805), with the additional note that below 60° F. the solubility decreases very rapidly.—*C.D.* '92, i. 445.

Medicinal Properties.—Hypnotic. It is stated to have much less influence on the heart than Chloral, and therefore may be used in cardiac disease, and that the dose need not be increased after continued use.

Given in all kinds of insomnia.—*L.* '89, ii. 849, 1192; '90, i. 339; *B.M.J.* '89, ii. 1326; '91, i. 1060; *M.P.* '89, ii. 571; *P.J.* (3) xxi. 104; *T.G.* '91, 634, 757; *Pr.* xlvii. 274; *B.M.J.* '05, ii., 1007. In insomnia with 'irregular' heart after influenza.—*B.M.J.* '94, ii. 1045.

The safest of the hypnotics for the insomnia of cardiac disease.—*B.M.J.* '97, ii. 857; '05, ii. 250. Chloralamide is safer but slower in action than Chloral Hydrate.—*L.* '99, ii. 143. 20 to 30 grains in a little spirit, useful as a sleeping draught for patients suffering from acute Bright's disease.—*Pr.* lxvii. 645, 658.

In the insomnia of enteric fever—30 to 40 grains, repeated in lesser amount in two hours.—*B.M.J.* '04, ii. 1452.

Prescribed with Potassium Bromide as a remedy for sea-sickness.—*Pr.* lvi. 145.

Dose.—20 to 50 grains = 1·3 to 3·24 grammes.

Ph. Ger. maximum single dose, 4 grammes; maximum daily dose, 8 grammes.

Prescribing Notes.—*It is prescribed in aqueous mixtures suspended with Tragacanth, or dissolved in weak Alcohol or Glycerin*; see *Haustus and Mistura given below.*

Foreign Pharmacopœias.—Official in Ger. (Chloralum formamidatum); Mex. (Cloralamido); U.S. (Chloralformamidum). Not in the others.

Tests.—Chloralamide has a melting point of 114° to 115° C. (237·2° to 239° F.). The aqueous solution of the salt should be neutral in reaction towards Litmus paper. It yields a turbid solution when warmed with Potassium or Sodium Hydroxide Solution, the solution clearing on the separation of the Chloroform produced by the decomposition, the evolved vapour possessing an alkaline reaction towards red Litmus paper.

The more generally occurring impurities are inorganic matter, Chloral Alcoholate, Ethyl Carbamate, free acids, *e.g.*, Formic and Hydrochloric Acids, and products of decomposition. Inorganic matter, Chloral Alcoholate, and Ethyl Carbamate are detected by the behaviour of the sample when carefully heated in an open dish no weighable residue should remain after ignition, and no inflammable vapours should be given off. Free acids are detected by the reaction of the alcoholic solution towards moistened blue Litmus paper, and products of decomposition by Silver Nitrate Solution; no immediate turbidity should be produced on the addition of a few drops of Silver Nitrate Solution to a 10 p.c. alcoholic solution.

Preparations.

HAUSTUS CHLORALAMIDI.—Chloralamide, 30 grains; Mucilage Mixture, to 1 oz.—*Guy's.*

If made with Mucilage of Tragacanth it diffuses more readily after standing.

Chloralamide, 30 grains; Alcohol (90 p.c.), 30 minims; Compound Tincture of Cardamoms, 30 minims; Chloroform Water to 1 oz.—*St. George's.*

MISTURA CHLORALAMIDI (*Squire*).—Chloralamide, 30 grains; Tincture of Orange, 1 fl. drm.; Spirit of Chloroform, 15 minims; Glycerin, ½ fl. oz.; Cinnamon Water, to 1 fl. oz.

Dose.—3 to 6 fl. drm. = 10·8 to 21·6 c.c., to be taken with Water.

MISTURA CHLORALAMIDI COMPOSITA (*Squire*).—Ammonium Bromide, 30 grains; Chloralamide Mixture (*Squire*), to 1 fl. oz.

Mistura Chloramidi Composita (*B.P.C.*).—Chloramide, 30 grains; Potassium Bromide, 30 grains; Alcohol, 72 minims; Distilled Water, to 1 fl. oz.

Dose.—½ to 1 fl. oz. Some quantity crystallises out on standing.

CHLOROBROM.—A preparation containing 30 grains of Chloralamide and 30 grains of Potassium Bromide in each fl. oz.

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c. Has been recommended as a preventive in sea-sickness; also in persistent vomiting not arising from sea-sickness, and in gastric ulcer.—*L.* '92, i. 518; '93, ii. 88, 367, 1564; '94, i. 1001; '95, i. 91. In insomnia and delirium tremens.—*L.* '93, ii. 1486; '95, i. 1307.

Not Official.

CHLORALOSE.

ANHYDRO-GLUCO-CHLORAL.

$C_8H_{11}O_6Cl_3$, eq. 307·13.

Colourless acicular crystals or a white, crystalline powder, possessing a bitter, disagreeable taste.

Medicinal Properties.—Hypnotic and sedative, but dose requires to be watched. Best adapted to cases of simple insomnia. Condemned as a hypnotic for general use, as patients rapidly become habituated to the drug, which then ceases to be effective. Found useful in doses of from 4 to 8 grains in cases of epilepsy complicated by insomnia.—*B.M.J.E.* '95, i. 104.

As small a dose as 4 grains has been found to produce alarming intoxication in a tuberculous patient.—*P.J.* (3) xxv. 1139.

In the insomnia and night sweats of phthisis.—*B.M.J.E.* '94, ii. 51; *T.G.* '95, 93; in the insomnia of asylum patients.—*B.M.J.E.* '93, ii. 75, 91; '94, i. 39; ii. 60.

Poisonous effects with large doses.—*Y.B.T.* '95, 83; *Pr.* lii. 98; *B.M.J.E.* '94, ii. 52.

2 to 10 grains in mental affections.—*B.M.J.E.* '01, ii. 87.

Its toxicity is greater than that of Chloral Hydrate.—*L.* '99, ii. 71.

Case of poisoning from 8 grains of Chloralose; loss of consciousness for six hours; recovery.—*L.* '00, ii. '03.

Dose.—3 to 10 grains = 0·2 to 0·65 gramme, given in **cachet.**

It is prepared by heating together equal parts of Anhydrous Chloral and Glucose, advantage being taken of the insolubility of Parachloralose to effect its separation from the Chloralose also produced during the reaction.

Solubility.—Insoluble in Water, soluble 1 in 31 of Alcohol (90 p.c.), 1 in 125 of Ether, readily soluble in Chloroform.

Tests.—Chloralose should possess a melting point of from 184° to 186° C. (363·2° to 366·8° F.). It possesses no well-defined chemical tests by which its presence can be identified.

Not Official.

CHLORETONE.

TRI-CHLOR-TERTIARY-BUTYL-ALCOHOL. CHLOR-BUTYL ALCOHOL.
ACETONE CHLOROFORM.

$C_4H_6Cl_3$ **(OH)** eq. 176·09.

Light, white, glistening crystals, having a strong camphoraceous odour and taste. It is volatile at the ordinary temperature of the air.

It may be obtained by the interaction of Chloroform, Acetone, and an alkali Hydroxide.

This must not be confused with Chloroform prepared from Acetone, which is also known as 'Acetone Chloroform.'

Solubility.—1 in 125 of Water; 6 in 4 of Alcohol (90 p.c.); also soluble in Chloroform and Ether; readily soluble in Glycerin and in Clove Oil.

Introduced as a hypnotic and local anæsthetic. It is also stated to possess slight analgesic and antiseptic properties.—*T.G.* xxiv. 18, 98; *L.* '00, i..106.

In epilepsy.—*T.G.* '01, 757.

As a hypnotic in 25 cases of mental disease, 1 to 1½ gramme doses. In restless subjects, 2 grammes may be given.—*B.M.J.E.* '02, i. 31.

The therapeutic and the toxic doses (*B.M.J.E.* '05, ii. 4) are so near one another that this drug has been discarded as a hypnotic altogether.

To prevent post-operative vomiting.—*P.J.* '03, i. 340.

5-grain doses every three hours to prevent sea-sickness.—*L.* '03, i. 615, 687; *C.D.* '03, i. 424.

5 grains Chloretone 15 minutes before embarking will generally ensure complete immunity during the Channel passage even in rough weather, and for longer voyages in rough weather it should be taken 20 minutes before meals two or three times a day; an efficient remedy in chorea; has a remarkably soothing effect in painful and irritable stomach conditions; a hypnotic in 10 grain doses (*L.* '07, i. 880); skin eruption due to chloretone treatment of chorea.—*L.* '07, i. 883.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Prescribing Notes.—*Conveniently given when dissolved in a mixture of Alcohol and Glycerin. It is suspended with difficulty by Mucilage of Gum Acacia or Tragacanth. Cachets and Powders should be enclosed in a bottle, but even under these circumstances there is considerable loss in a month or two.*

Tests.—Chloretone melts at 80° to 81° C. (176° to 177·8° F.), but when anhydrous the melting point is raised to 95° to 96° C. (203° to 204·8° F.). It should be readily and completely soluble in Alcohol (90 p.c.).

1 c.c. of an aqueous solution of the salt when warmed with 1 c.c. of Potassium or Sodium Hydroxide Solution and sufficient Iodine Solution to colour the liquid distinctly brown yields a pale yellow precipitate of Iodoform.

1 c.c. of a saturated aqueous solution warmed with 2 c.c. of Potassium or Sodium Hydroxide and one or two drops of Aniline evolves the powerful, penetrating and highly poisonous odour of Phenyl-isonitrile. It should volatilise completely when heated, and should leave no weighable residue upon ignition.

CHLORETONE ELIXIR.—Chloretone, 10 grains; Spirit of Peppermint, 10 minims; Compound Tincture of Cardamoms, 1 fl. drm.; Glycerin, *q.s.* to make 2 fl. drm.; dilute immediately before use with 1 fl. oz. of Water for a dose.

Not Official.

CHLORI LIQUOR.

SOLUTION OF CHLORINE.

Syn.—AQUA CHLORI.

A yellowish-green liquid, possessing a powerful characteristic odour of Chlorine.

It is not now included in the text of the *B.P.*, but is transferred to the Appendix.

Medicinal Properties.—Deodoriser, antiseptic, and disinfectant. When diluted it is used as a **gargle** in smallpox, scarlatina, diphtheria, and putrid sore throat, and as a **wash** for ulcers, cancerous sores, buboes, and large abscesses.

Strongly advocated by Burney Yeo in the treatment of enteric fever. The solution he uses is obtained by pouring strong Hydrochloric Acid over Potassium Chlorate, thus: into a 12 oz. bottle put 30 grains powdered Potassium Chlorate, and pour on it 1 fl. drm. strong Hydrochloric Acid, cork, shake, and allow gas to generate, then add Water little by little till bottle is filled. He says it gives much better results and is more pleasant to take than the Liquor Chlori of the *B.P.* '85. To 12 fl. oz. of this solution he adds 24 to 36 grains of Quinine and 1 fl. oz. of Syrup of Orange peel; he gives 1 fl. oz. of this mixture every two, three, or four hours, according to the severity of the case. It is prescribed as **Mistura Chlori c. Quinina** (*Burney Yeo*).

Further experiments on its use recorded in the Bradshaw Lecture on the treatment of enteric fever (*B.M.J.* '04, ii. 1450) have shown that the tendency to intestinal fermentation is lessened, and the strength of the circulation well sustained, with corresponding benefit to the general aspect of the case.

Dose.—10 to 20 minims = 0·6 to 1·2 c.c., in a wineglassful of Water.

Incompatibles.—Salts of Lead and Silver.

Antidotes.—In case of poisoning by Chlorine Water, the antidotes are White of Egg, Milk, Flour.

Foreign Pharmacopœias.—Official in Austr. (Aqua Chlori), not less than 0·4 p.c. of Chlorine; Hung., Russ. and U.S. (Liquor Chlori Co.), about 0·4 p.c.; Ger. (Aqua Chlorata), contains 0·4 to 0·5 p.c. of Gas; Dutch (Solutio Chlori), 0·4 to 0·425 p.c.; Swiss (Chlorum Solutum), 0·4 to 0·5 p.c.; Port. (Soluto de Chloro); Span. (Agua de Cloro). Not in Belg., Dan., Fr., Ital., Jap., Mex., Norw. or Swed.

Tests.—Solution of Chlorine should possess a specific gravity of 1·003, should first redden and then bleach blue Litmus paper, should immediately decolorise Indigo Sulphate Solution, should liberate Iodine from Potassium Iodide Solution. The latter reaction is utilised for the quantitative determination of the percentage of Chlorine. It should contain not less than 0·5 p.c. as determined by adding a measured quantity of 10 c.c. of the Liquor to a solution of 1 gramme of Potassium Iodide dissolved in 25 c.c. of Water; not less than 14·2 c.c. of Deci-normal Volumetric Sodium Thiosulphate Solution being required to decolorise the liquid, using Starch Solution as an indicator. It should leave no weighable residue upon evaporation.

LIQUOR CHLORI COMPOSITUS (*U.S.*).—Potassium Chlorate, granulated, 5 grammes; Hydrochloric Acid, 18 c.c.; Distilled Water, to 1000 c.c. Add the Hydrochloric Acid diluted with 20 c.c. of Distilled Water to the Potassium Chlorate contained in a flask of the capacity of about 2000 c.c. Insert in the flask a stopper perforated to admit a funnel of the capacity of about 100 c.c. containing about 10 grammes of purified Cotton well wetted with cold Water; place the flask on a water-bath containing boiling Water for a period of from 2 to 3 minutes; when the flask is completely filled with a greenish yellow gas remove it from the bath and add cold Distilled Water through the Cotton in the funnel in two separate portions of 500 c.c. each. After the addition of each separate portion of cold Distilled Water stopper the flask securely, invert, and thoroughly agitate the contents. This solution should be freshly made when wanted. Average dose:—4 c.c. (1 fl. drm.).

LIQUOR CHLORI.—Potassium Chlorate, 50 grains; Hydrochloric Acid, 100 minims; Water, to 1 pint. Add the Acid to the Chlorate in a large bottle; when the Chlorine given off has displaced the air, add the Water gradually, corking and shaking the bottle after each addition.—*St. Bartholomew's.*

The solution recommended (*B.M.J.* '93, i. 1004) for the preparation of '**Euchlorine**' solution for use as a gargle in diphtheria, contains an excess of

Potassium Chlorate. Place 20 to 30 grains of Potassium Chlorate in a dry 8 oz. bottle with 10 minims of strong Hydrochloric Acid; the fumes will fill the bottle, which on the addition of Water with shaking will make a good solution.

These ingredients in varying quantities are given in other Hospital Pharmacopœias.

A Chlorine solution strongly recommended for irrigation of the fauces in diphtheria is made by pouring 5 minims of strong Hydrochloric Acid on 9 grains of powdered Potassium Chlorate, and gradually adding an oz. of Water.—*L.* '03, ii. 1774.

Sodium Chlorate is a tasteless salt, and answers equally well for the formation of 'Euchlorine.'

GARGARISMA CHLORI.—Potassium Chlorate, 200 grains; Strong Hydrochloric Acid, 40 minims; Water, to 20 fl. oz. Place the Potassium Chlorate in a dry bottle, pour the Acid upon it, and set aside, loosely corked, for 10 minutes. Then add the Water in 4 or 5 successive portions, shaking between each addition, so that the gas may be absorbed as completely as possible.

Note.—This gargle is usually employed diluted with one or more parts of Water. It should be recently prepared as it deteriorates slowly on standing, and quickly if exposed to light.—*St. Thomas's.*

The quantities given in the *B.P.C.* are:—Potassium Chlorate, 2·25; Hydrochloric Acid, 0·50; Distilled Water, sufficient to make 100·00. Same directions as above.

VAPOR CHLORI (*B.P.* 1885).—Chlorinated Lime, 2 oz.; cold Water, a sufficiency. Put the powder into a suitable apparatus, moisten it with the Water and let the vapour that arises be inhaled.

CHLOROFORMUM.

CHLOROFORM.

TRICHLORO-METHANE, METHENYL TRICHLORIDE.

$CHCl_3$, eq. 118·48.

FR., CHLOROFORME; GER., CHLOROFORM; ITAL., CLOROFORMIO; SPAN., CLOROFORMO.

A clear, colourless, heavy, mobile liquid, possessing a distinctive ethereal odour, and a sweet burning taste.

It may be prepared by the action of Chlorinated Lime on Ethyl Alcohol or on Acetone. The product obtained by its action on Methylated Alcohol is known as Methylated Chloroform.

The *U.S.P.* defines Chloroform as a liquid consisting of from 99 to 99·4 p.c. by weight of absolute Chloroform, and 0·6 to 1·0 p.c. of Alcohol, but the quantity of Alcohol is not now defined in the *B.P.* except that the product is worked to a specific gravity 1·490 to 1·495.

It should be kept in well-stoppered amber-tinted glass bottles, in a cool place, and protected as far as possible from the light.

Solubility.—10 in 7 of Alcohol (90 p.c.); in all proportions of Ether and Alcohol; freely in Olive Oil and Oil of Turpentine. In Water at 32° F. 1 in 150, at 60° F. 1 in 185, at 86° F. 1 in 210, at 113° F. 1 in 200, at 130° F. 1 in 192. Will not dissolve in Glycerin.

Chloroform acts on Vulcanite, and dissolves Caoutchouc, Gutta-percha, Mastic, Elemi, Tolu, Benzoin and Copal. Amber, Sandarach, Lac and Beeswax are only partially soluble. It also dissolves Iodine, Bromine, most of the alkaloids, the fixed and volatile Oils, most Resins and Fats. It dissolves Sulphur and Phosphorus sparingly.

Medicinal Properties. A general anæsthetic. Internally a sedative, carminative and antispasmodic. Its chief use is to produce general anæsthesia by **inhalation** during surgical operations, uræmic and puerperal convulsions, and in obstetric practice. Should be given with great caution in cases of fatty and dilated heart, in extensive lung disease and severe anæmia. Internally, useful to relieve flatulent distension of stomach and bowels, and the cough of fibroid phthisis; in delirium tremens, and in sea-sickness. Externally, with Camphor, relieves toothache and neuralgia. Applied immediately after the sting of a wasp, takes away the pain. A powerful auxiliary to the Liniments of Aconite and Belladonna.

Its vapour and aqueous solution are antiseptic, and the addition of 1 minim to 1 fl. oz. of animal or vegetable infusion will preserve it.

Vinegar after Chloroform inhalation to prevent sickness. (*See* p. 9.)

Chloroform should not be used as an anæsthetic in a room where gas is being burned; a mixture of Chloroform vapour and air being decomposed by a flame with the formation of irritating compounds.—*L.* '99, i. 1728; *T.G.* '99, 601; *P.J.* '02, i. 376.

The dosage of Chloroform for inhalation. A powerful and dangerous anæsthetic, not to be recommended in minor surgery. The notorious uncertainty and danger in Chloroform administration is the uncertainty in the quantity administered. 0·2 c.c. per minute recommended, in a mixture of Chloroform and air at an average percentage of 1·5 p.c.—*B.M.J.* '98, i. 1057–1062.

An apparatus for ensuring its admixture with air in certain proportions is described in *B.M.J.* '04, ii. 1462. The Report of the Chloroform Committee was presented at the Oxford meeting of the British Medical Association, the Vernon Harcourt inhaler was introduced, and the adoption of a maximum strength of 2 p.c. Chloroform vapour as an adequate and safe limit for general surgical purposes recommended (*B.M.J.* '03, ii. 141; '04, ii. 161; *L.* '04, ii. 1856); a further reference to the subject is made (*J.C.S. Abs.* 1904, ii. 756), showing all that was necessary in the air was 2 p.c., and that danger lay beyond. It has latterly been shown (*J.C.S.* 1904, *Trans.* 949; *L.* '05, i. 589) that Chloroform derived from Acetone is inferior in anæsthetic properties to Chloroform derived from Alcohol. The difference is stated to be due to the presence of 0·05 p.c. Æthyl Chloride. Acetone Chloroform to which this amount of Æthyl Chloride had been added, exhibited equally as good anæsthetic effects as Chloroform prepared from Æthyl Alcohol. This statement has, however, been challenged by Messrs. J. F. MacFarlan & Co. (*L.* '05, i. 747), who think that Chloroform prepared from Acetone is by no means generally accepted as inferior to Chloroform prepared from Alcohol, and that up to the present insufficient evidence has been adduced to establish these views.

Less Chloroform is required when preceded by Morphine Scopolamine injections. (*See* p. 650.)

Dose.—1 to 5 minims = 0·06 to 0·3 c.c.

Ph. Ger. maximum single dose, 0·5 gramme; maximum daily dose, 1·5 grammes.

Prescribing Notes.—*Chloroform Water and Spirit of Chloroform are used as sweetening agents, and to preserve solutions from decomposition. As a rule in 'mixtures' Chloroform is in such small quantities as to dissolve in the Water; in concentrated 'mixtures' Mucilage of Gum Acacia would be required to suspend it; it can be given in 'drops' dissolved in some strongly alcoholic menstruum.*

It mixes readily with Camphor Liniment, Soap Liniment, Olive Oil, or Oil of Turpentine.

Camphorated Chloroform, see *Camphor.*

Official Preparations.—Aqua Chloroformi, Linimentum Chloroformi, Spiritus Chloroformi, Tinctura Chloroformi et Morphinæ Composita.

Not Official.—Chloræthoform, Chlorodynum, Emulsio Chloroformi, Liquor

Chloroformi Compositus, Mistura Tussi Rubra Concentrata, Misturi Chloroformi Composita, Parogenum Chloroformi Camphoratum, Pommade de Chloroforme, Tinctura Chloroformi Composita, Chloroformum Camphoratum, Carbon Tetrachloride, A.C.E. Mixture, Vienna Mixture, 'Methylene,' Regnauld's Anæsthetic Mixture, Pental, Vapor Chloroformi Compositus, Vasolimentum Chloroformi Camphoratum.

Antidotes. In case of overdose of Chloroform, the antidotes are, fresh pure air and artificial respiration (*M.T.* '74, ii. 219), and Amyl Nitrite.—*L.* '75, i. 644; *B.M.J.* '97, ii. 352. Hypodermic injection of Strychnine, altogether $\frac{1}{2}$ grain was used in divided doses of $\frac{1}{8}$ grain followed by $\frac{1}{12}$ grain.—*B.M.J.* '97, ii. 1498.

Foreign Pharmacopœias.—Official in Austr. and Belg., sp. gr. 1·485 to 1·490; Fr. sp. gr. 1·495 to 1·500; U.S., sp. gr. not below 1·476 at 25° C. (77° F.); Dan., Dutch, Ger., Hung., Norw., Swed. and Swiss, sp. gr. 1·485 to 1·489; Ital., sp. gr. 1·490 to 1·493; Jap., sp. gr. 1·485 to 1·495; Mex., Port. and Span., sp. gr. 1·480; Russ., sp. gr. 1·499 to 1·500.

The new Austr., Dutch and Swiss Pharmacopœias include Chloroform and Chloroform pro narcosi. The Austr. and Swiss Chloroform and Chloroform pro narcosi are required both to possess the same sp. gr., the Dutch Chloroform possesses the sp. gr. 1·485 to 1·489, that 'pro narcosi' a sp. gr. of 1·498 to 1·500, and is prepared by the decomposition cf Chloral Hydrate by Sodium Hydroxide. Fr. has Chloroforme rectifié du commerce sp. gr. 1·495 to 1·500 which must not be used as an anæsthetic; also Chloroforme anæsthésique sp. gr. 1·498 which is prepared from the other.

Tests.—The distinguishing tests for Chloroform are the specific gravity, which is about 1·490, and the boiling point, which should be about 61° C. (141·8° F.). Pure Chloroform has a specific gravity of 1·5, and boils at 60·8° C. (141·44° F.). The *B.P.* gives the specific gravity as 1·490 to 1·495; the *U.S.P.* not below 1·476 at 25° C. (77° F.); the *P.G.* 1·485 to 1·489. The *B.P.* and the *P.G.* give a similar boiling point 60° to 62° C. (140° to 143·6° F.); the *U.S.P.* gives 60° to 61° C. (140° to 141·8° F.). When boiled with Potassium or Sodium Hydroxide Solution it is decomposed yielding a solution which gives with Silver Nitrate Solution, when acidified with Nitric Acid, a white curdy precipitate soluble in Ammonia Solution and which is rapidly blackened on heating. A few drops of Chloroform when warmed with 2 or 3 c.c. of an alcoholic Potassium or Sodium Hydroxide Solution and a drop or two of Aniline evolve the powerful, penetrating and highly poisonous odour of Phenyl-isocyanide. A few drops of Chloroform, when heated with Fehling's (Potassio-cupric Tartrate) Solution, yield a reddish deposit of Cuprous Oxide.

The more generally occurring impurities are pyrogenous oils, acid, free Chlorine, Chlorides, secondary products of decomposition and fixed matter. Acid, free Chlorine, and Chlorides are all extracted by means of Water, and if the sample be shaken for 5 minutes with twice its volume of Water, free Acid may be detected in the aqueous liquid by its reaction towards blue Litmus paper; Free Chlorine by any blue coloration produced on the addition of 1 c.c. of Cadmium Iodide Solution and 2 drops of Starch Mucilage; and Chlorides by the addition of Silver Nitrate Solution, when not more than a very slight opalescence should be produced. In testing for Free Chlorine the *B.P.* uses Cadmium Iodide Solution, the *U.S.P.* Potassium Iodide Test Solution, and the *P.G.* Zinc Iodide Solution. Pyrogenous oils may be detected by allowing a definite volume to evaporate from a large piece of filter paper placed on a warm plate, when no foreign odour should be perceptible. The *B.P.* employs 20 c.c. for this test, the *U.S.P.* 10 c.c., whilst the *P.G.* specifies no particular quantity. The *B.P.* requires that no odour should be perceptible at any stage of the evaporation, the *U.S.P.* that an odour should not be perceptible during the later stages of the evaporation and the filter paper should remain odourless; the *P.G.* that the filter paper shall not retain any foreign odour after the evaporation of the Chloroform. Secondary products of decomposition may be detected by the behaviour of the specimen with concentrated Sulphuric Acid. After shaking the acid with 10 times its volume of Chloroform for 20 minutes, and allowing the mixture to remain at rest for 15 minutes, both the acid and the chloroformic layers should be perfectly transparent and nearly colourless, a portion of the Sulphuric Acid layer diluted with Water should remain transparent, should be very nearly colourless and should possess no disagreeable odour; and if the liquid be further diluted and tested with Silver Nitrate Solution no more than a slightly diminished transparency should be caused. The *U.S.P.* divides this test into three separate headings indicating impurities decomposable by Sulphuric Acid, odorous decomposition products, and chlorinated decomposition compounds. Fixed matter may be detected by any residue remaining after the evaporation of the Chloroform.

Starch Solution and Cadmium, Potassium or Zinc Iodide.—The aqueous portion obtained by shaking Chloroform with twice its volume of Water for five minutes, should not afford any colour with 1 c.c. of Cadmium Iodide T.S. and 2 drops of Mucilage of Starch, *B.P.*; when Chloroform is shaken with Zinc Iodide and Starch Solution, the Starch Solution should not become blue, nor the Chloroform coloured, *P.G.* The *U.S.P.* requires that the aqueous solution should not become coloured with T.S. of Potassium Iodide.

Silver Nitrate.—The addition of 4 drops of Silver Nitrate Solution should not produce more than a very slight opalescence in the aqueous portion obtained by shaking Chloroform with twice its volume of Water for 5 minutes, *B.P.*; should not be affected by T.S. of Silver Nitrate, *U.S.P.* It should not yield any turbidity with T.S. of Silver Nitrate diluted with as much Water, *P.G.*

Sulphuric Acid.—Chloroform when shaken with one-tenth of its volume of Sulphuric Acid for 20 minutes and set aside for 15 minutes should acquire practically no colour in either the chloroformic or Sulphuric Acid layer, and both should be quite transparent, *B.P.*; the *U.S.P.* directs the use of 4 c.c. of Sulphuric Acid and 40 c.c. of Chloroform shaken in a 50 c.c. glass stoppered cylinder during 5 minutes, and that the liquids be allowed to separate completely so that both are transparent. The Chloroform should remain colourless and the acid should appear colourless or very nearly so when in a stratum of not less than 15 mm. in thickness. In the *P.G.* test 15 c.c. of acid are shaken with 20 c.c. of Chloroform in a stoppered glass cylinder of 3 cm. diameter previously rinsed out with Sulphuric Acid. The acid should not become coloured within 1 hour.

2 c.c. of the Sulphuric Acid liquid obtained on shaking the Chloroform as above described, when diluted 2½ times its volume of Water should remain clear, almost colourless, and should possess a pleasant odour, *B.P.*; should be colourless and clear and while hot from the mixing should be odourless or give but a faint vinous or ethereal odour, *U.S.P.* The liquid obtained in carrying out the *B.P.* test, immediately above, should still retain its transparency and freedom from colour, even when further diluted with 10 c.c. of Water and stirred with a glass rod, and the transparency should not be more than slightly diminished on the addition of 4 drops of Silver Nitrate Solution, *B.P.*; should remain clear and

should not be affected by T.S. of Silver Nitrate, *U.S.P.* The addition of Silver Nitrate Solution should not more than slightly diminish the transparency of the aqueous portion obtained by shaking the Sulphuric-Acid-treated Chloroform with twice its volume of Water, *B.P.*

Volumetric Determination.—Chloroform may be determined in the absence of other reducing substances by Fehling's Solution. A more accurate method is to pass the vapour through a red-hot tube containing Platinum wire-gauze, which decomposes the Chloroform with the formation of Hydrochloric Acid. The products are collected in a bulb-tube containing Water, and the acid produced is titrated with Volumetric Potassium or Sodium Hydroxide Solution. 108·57 parts by weight of Hydrochloric Acid are equivalent to 118·48 parts by weight of Chloroform. This method has been applied to the determination of Chloroform in animal tissues (*B.M.J.* '01, ii. 1859), but the Hydrochloric Acid is recommended to be determined with Volumetric Silver Nitrate Solution, the excess of Silver being determined with Volumetric Ammonium Thiocyanate Solution, using Ferrous Ammonium Sulphate Solution as an indicator. In using the combustion method of determination for Chloroform in blood, the blood should be mixed with an equal volume of a saturated aqueous solution of Urea, by which means (*B.M.J.* '03, ii. cxlii.) the blood remains fluid during the necessary heating and more than 90 per cent. of the Chloroform is accounted for.

Preparations.

AQUA CHLOROFORMI. Chloroform Water.

Chloroform, 30 minims; Distilled Water, *q.s.* to make 25 fl. oz. (1 in 400)

Half the strength of *B.P.* 1885.

Dose.—$\frac{1}{2}$ to 1 fl. oz. = 14·2 to 28·4 c.c.; but ordered in smaller quantities as a flavouring agent.

Foreign Pharmacopœias.—Official in Austr. (1 in 100); Belg., Dan., Fr., Norw. and Swiss (1 in 200); Dutch, Solutis Chloroformi Aquosa (1 in 250); Ital. (1 in 2000); Jap. (1 in 400); Span. (1 in 250); U.S., Saturated Aqueous Solution. Not in the others.

Tests.—Chloroform Water has a specific gravity of 1·001; should be neutral in reaction to Litmus paper, and when warmed with a little Alcoholic Potassium or Sodium Hydroxide Solution and a few drops of Aniline should evolve the powerful, penetrating, and highly-poisonous vapours of Phenyl-isocyanide.

LINIMENTUM CHLOROFORMI. Liniment of Chloroform.

Chloroform, 1; Liniment of Camphor, 1. (1 in 2)

The Oil in the Camphor Liniment prevents rapid evaporation of the Chloroform.

Foreign Pharmacopœias—Official in Ger. and Jap. (Oleum Chloroformi), Chloroform 1, Olive Oil 1; Austr. (Linimentum Chloroformiatum), Chloroform, Oleoso-balsamic Mixture, Spirit of Ether, Spirit of Camphor, Spirit of Potash Soap, equal parts of each; Fr. (Liniment au Chloroforme), Chloroform 1, Poppy Oil 9; Swed. (Linimentum Chloroformi Comp.), Chloroform 3, Camphor 3, Alcohol (90 p.c.) 5, Camphorated Soap Liniment 6, Tincture of Opium 3; Swiss (Oleum Chloroformi), Chloroform 1, Olive Oil 3. Jap. has also Linimentum Chloroformii, Chloroform 1, Camphor Oil 1. All by weight. U.S., Chloroform 3, Soap Liniment 7. Not in the others.

Tests.—It should possess a specific gravity of 1·212, and contains about 37 p.c. w/v of total solid residue.

SPIRITUS CHLOROFORMI. SPIRIT OF CHLOROFORM. *B.P.Syn.* —CHLORIC ETHER; SPIRIT OF CHLORIC ETHER.

Chloroform, 1; Alcohol (90 p.c.), *q.s.* to make 20. (1 in 20)

Dose.—5 to 20 minims = 0·3 to 1·2 c.c., for repeated administration; for a single administration 30 to 40 minims = 1·8 to 2·4 c.c.

Frequently prescribed as a sweetening agent, and to cover nauseous flavours.

Foreign Pharmacopœias.—Official in Jap., 1 in 20; U.S., Chloroform 6, Alcohol 94. Not in the others.

Tests.—Spirit of Chloroform has a specific gravity of about 0·860; and should leave no weighable residue on evaporation.

TINCTURA CHLOROFORMI ET MORPHINÆ COMPOSITA. COMPOUND TINCTURE OF CHLOROFORM AND MORPHINE.

Chloroform, 1½ fl. oz.; Morphine Hydrochloride, 87½ grains; Diluted Hydrocyanic Acid, 1 fl. oz.; Tincture of Capsicum, ½ fl. oz.; Tincture of Indian Hemp, 2 fl. oz.; Oil of Peppermint, 14 minims; Glycerin, 5 fl. oz.; Alcohol (90 p.c.), *q.s.* to make 20 fl. oz. (about 1 in 13)

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

10 minims contain Chloroform ¾ minim, Morphine Hydrochloride, $\frac{1}{11}$ grain, Diluted Hydrocyanic Acid ½ minim, Tincture of Indian Hemp 1 minim.

It is nearly 4½ times stronger in Morphine than *B.P.* 1885, and in other respects differs considerably.

The *B.P.* 1885 preparation was practically the same as Liquor Chloroformi Compositus (*Squire*), except that the former contained four times as much Morphine as the latter. In *B.P.* 1898 the formula was completely changed, therefore Liquor Chloroformi Compositus, previously omitted in *Companion*, is re-inserted.

The *B.P.C.* have also added a formula under the name 'Chlorodyne' (*see* below).

Foreign Pharmacopœias.—Official in Jap. Hung. has a 'Chlorodyne, but it differs considerably from *B.P.* Not in the others.

Tests.—Compound Tincture of Chloroform and Morphine has a specific gravity of 1·010 to 1·015; it should contain from 28·0 to 30·0 p.c. w/v of total solids and from 52 to 54 p.c. w/v of Absolute Alcohol.

Not Official.

LIQUOR CHLOROFORMI COMPOSITUS (*Squire*).—Chloroform, 4 fl. oz.; Ether, 1 fl. oz.; Alcohol (90 p.c.), 4 fl. oz.; Treacle, 4 fl. oz.; Extract of Liquorice, 2¼ oz.; Morphine Hydrochloride, 8 grains; Oil of Peppermint, 16 minims; Syrup, 17½ fl. oz.; Prussic Acid (2 p.c.), 2 fl. oz. Mix the Oil of Peppermint, Alcohol and Prussic Acid together, and dissolve the Morphine Hydrochloride in the mixture; add the Chloroform and Ether; dissolve the Extract of Liquorice in the Syrup, add the Treacle, and mix in the other ingredients.

This formula first appeared in the *Companion* in 1864.

Dose.—5 to 10 minims = 0·3 to 0·6 c.c.

10 minims contain Chloroform about 1 minim, Diluted Hydrocyanic Acid ½ minim, Morphine Hydrochloride $\frac{1}{240}$ grain.

CHLORODYNUM (*B.P.C.*).—Chloroform, 6·00; Morphine Hydrochloride, 0·50; Tincture of Indian Hemp, 3·00; Tincture of Capsicum, 1·50; Liquid

Extract of Liquorice, 12·00; Mucilage of Acacia, 12·00; Treacle, 25·00; Glycerin, 22·00; Oil of Peppermint, 0·10; Alcohol, sufficient to produce 100·00.

10 minims contain Chloroform about $\frac{1}{2}$ minim, and Morphine Hydrochloride about $\frac{1}{20}$ grain, and no Hydrocyanic Acid.

The *B.P.C.* Chlorodyne Lozenges contain about $\frac{1}{65}$ grain of Morphine Hydrochloride.

EMULSIO CHLOROFORMI.—Chloroform, 1 fl. oz.; Tincture of Quillaia, 1 fl. drm.; Water, to 20 fl. oz.—*London.*

Chloroform, 1 fl. oz.; Tincture of Quillaia, 3 fl. drm.; Water, to 20 fl. oz.—*St. Thomas's.*

The *B.P.C.* quantities are very similar: Chloroform, 5; Tincture of Quillaia, 2; Distilled Water, to make 100.

MISTURA TUSSI RUBRA CONCENTRATA.—Diluted Hydrobromic Acid, 15 minims; Compound Tincture of Chloroform, 10 minims; Compound Tincture of Cardamoms, 10 minims; Solution of Morphine Hydrochloride, 5 minims; Diluted Hydrocyanic Acid, 1 minim; Syrup of Wild Cherry, to 1 fl. drm.—*Australian Pharmaceutical Formulary.*

Mistura Chloroformi Composita. *Syn.* Mistura Tussi Rubra.—Morphine Hydrochloride, $\frac{1}{16}$ grain; Diluted Hydrobromic Acid, 30 minims; Chloroform, $\frac{1}{2}$ minim; Tincture of Cudbear, $7\frac{1}{2}$ minims; Syrup of Wild Cherry, 30 minims; Syrup, to 2 fl. drm.—*B.P.C.*

This formula has been changed very considerably in the *B.P.C. Supplement*, and as now amended reads:—Morphine Hydrochloride, 0·05; Diluted Hydrobromic Acid, 12·5; Cherry-laurel Water, 3; Chloroform, 0·25; Syrup of Tolu, 25; Tincture of Cudbear, 9; and sufficient Syrup to produce 100.

POMMADE DE CHLOROFORME.—Chloroforme rectifié 10, Yellow Wax 5, Lard 85.—*Fr.*

TINCTURA CHLOROFORMI COMPOSITA.—Chloroform, 2; Alcohol (90 p.c.), 8; Compound Tincture of Cardamoms, 10. (1 in 10)

It first appeared in *B.P.* 1885, but was omitted in 1898, and subsequently included in *B.P.C.*

Dose.—5 to 60 minims = 0·3 to 3·6 c.c.

The Chloroform will separate if this Tincture is prescribed in too little Water. Has been given successfully for the prevention of sea-sickness.

CHLOROFORMUM CAMPHORATUM.—Camphor, 2; Chloroform, 1; dissolve.—*B.P.C. Formulary* 1901, incorporated in *B.P.C.*

A remedy for toothache, and topically applied for rheumatism.

A.C.E. MIXTURE.—Alcohol (90 p.c.), 1; Chloroform, 2; Ether, 3; mix.

Used as an anæsthetic in place of Chloroform.—*Med. Chir. Trans.* vol. 47, '64, 341; *B.M.J.* '87, ii. 975, 1078, 1185, 1314, 1359. Advantages over Chloroform.—*B.M.J.* '97, ii. 160.

A.C.E. (*Martindale*).—Absolute Alcohol (sp. gr. 0·795), 1; Chloroform (sp. gr. 1·497), 2; Purified Ether (sp. gr. 0·720), 3.

VAPOR CHLOROFORMI COMPOSITUS (*B.P.C.*).—Alcohol (90 p.c.), 4; Chloroform, 8; Purified Ether, *q.s.* to make 25.

VASOLIMENTUM CHLOROFORMI CAMPHORATUM.—Camphor, 3; Chloroform, 3; Liquid Vasoliment (*see* p. 864), 3; all by weight.—*Hager.*

Parogenum Chloroformi Camphoratum. *Syn.* Camphorated Chloroform Vasoliment.—Camphor, 3; Chloroform, 2; Parogen (*see* p. 864), 3.—*B.P.C.*

VIENNA MIXTURE.—Ether, 3; Chloroform, 1; by weight.

'METHYLENE' (formerly called Methylene Bichloride).—Introduced by B. W. Richardson in November, 1867. It is a limpid, dense fluid, sp. gr. varies; when dropped into Water about one-fourth of it is dissolved, the remainder separates like Chloroform at the bottom of the vessel as a perfectly clear and distinct fluid, and the whole has a sweet, pleasant odour, without the least smell of Ether.

Recommended as an anæsthetic in place of Chloroform.

REGNAULD'S ANÆSTHETIC MIXTURE.—Chloroform, 4; Methylic Alcohol, 1; mix.

Used as an anæsthetic in place of Chloroform.

CHLORÆTHOFORM.— Chloroform (from Acetone), 100; Ethyl Chloride, 0·25.

CARBON TETRACHLORIDE. A colourless, volatile, heavy liquid. It may be prepared by the action of dry Chlorine gas on Carbon Bisulphide vapour, or by replacing the Hydrogen ion of Chloroform with the Chlorine ion.

It should be kept in dark amber-tinted glass-stoppered bottles, and in a cool atmosphere.

Has been employed to produce anæsthesia; but its principal use is as an inhalation in hay fever, and as an application on Piline for neuralgia.

Danger attending its use as a hair-wash (*B.M.J.* '07, ii. 764, 776); or dry shampoo.—*L.* '07, i. 1709.

Tests.—Carbon Tetrachloride has a specific gravity of 1·599 to 1·600 and a boiling point of 77° to 78° C. (170·6° to 172·4° F.). When warmed with Potassium or Sodium Hydroxide Solution, it is decomposed with the formation of Potassium or Sodium Chloride and Carbonate, the liquid effervescing on the addition of dilute Nitric Acid, and the faintly acidified liquid yielding with Silver Nitrate Solution a white precipitate, insoluble in Nitric Acid, but soluble in Ammonia Solution. When warmed with an alcoholic Potassium or Sodium Hydroxide Solution and a few drops of Aniline it evolves the powerful, penetrating, and highly-poisonous vapours of Phenol-isocyanide.

It may be contaminated with other Chlorine compounds or with chlorinated decomposition products, *e.g.*, Hydrochloric Acid. The former may be detected by the darkening in colour produced when a portion of the specimen is mixed with an equal volume of concentrated Sulphuric Acid, the latter by shaking the sample with twice its volume of Water and noting the reaction of the aqueous liquid towards Litmus paper and Silver Nitrate Solution; it should neither redden blue Litmus paper nor should it produce a turbidity with Silver Nitrate Solution.

PENTAL (Trimethylethylene). A colourless, mobile, inflammable liquid. Has been recommended as a general anæsthetic for short operations. Whitla states that several deaths have been attributed to it, and that it causes albuminuria.—*M.A.* '95, 40; *L.* '94, i. 1080; '96, i. 45, 710, 950; *T.G.* '93, 34; '94, 555; *B.M.J.E.* '93, ii. 28; *B.M.J.* '96, i. 730.

CHRYSAROBINUM.

CHRYSAROBIN.

FR., CHRYSAROBINE; GER, CHRYSAROBINUM; ITAL., CRISAROBINA; SPAN., CHRYSAROBINA.

An odourless and tasteless, yellow, crystalline powder, obtained from Araroba.

Purified Chrysarobin was introduced into medicine incorrectly as **Chrysophanic Acid**, and it is still known by this name, which, however, only correctly applies to the oxidised product.

Araroba yields from 55 to 80 p.c. (average 71 p.c.) of Chrysarobin.—*P.J.* (3) xxii. 544.

Medicinal Properties.—In form of **unguentum** or **pigmentum**, it has been found efficient in chronic psoriasis, and is a powerful parasiticide in ringworm and other parasitic skin diseases, but as it may cause erythema it requires watching; it should not be allowed to touch the healthy skin. The ointment stains the skin yellow, also the linen. Has been given internally for psoriasis, eczema and acne; but it is very irritating, producing purging, griping and vomiting even in very small doses.

To remove the stains from linen first remove all grease with Benzin and then apply a solution of Chlorinated Lime. In some cases a little Caustic Soda solution also may be necessary.—*C.D.* '99, i. 652.

Alopecia areata, treated almost exclusively with Chrysarobin stick—Chrysarobin, 30; Colophony Resin, 5; Yellow Wax, 35; Olive Oil (by weight), 30 (*B.M.J.E.* '95, ii. 103); and with excellent result by ointment 2 drm. to oz.—*B.M.J.* '07, ii. 491.

Chrysophanic Acid is not an efficient substitute for Chrysarobin in the treatment of psoriasis.—*B.M.J.E.* '96, ii. 96.

Used in the form of an ointment (*B.M.J.* '05, i. 699) either alone or combined, according to circumstances, with Tar or Salicylic Acid, it cures chronic psoriasis.

Dose.—$\frac{1}{10}$ to 1 grain = 0·006 to 0·06 gramme.

Official Preparation.—Unguentum Chrysarobini.

Not Official.—Unguentum Chrysarobini Compositum, Pigmentum Chrysarobini, Chrysarobin Plaster Mulls, Anthrarobin, Eurobin, Lenirobin.

Foreign Pharmacopœias.—Official in Austr. (Araroba Depurata); Belg., Dan., Dutch, Ger., Ital., Jap., Norw., Russ., Swed., Swiss and U.S. (Chrysarobinum); Mex. (Crisarobina), the purified product. Not in the others.

Tests.—Chrysarobin melts, according to the *U.S.P.*, at about 157° C. (314·6° F.). It varies in its behaviour towards different solvents; in Water it is only slightly soluble; in Petroleum Spirit it partly dissolves. It is almost completely soluble in hot Alcohol (90 p.c.) and completely soluble in Chloroform; the *B.P.* mentions that it partially dissolves in Potassium Hydroxide Solution, assuming a deep brownish-red colour; the *U.S.P.* that it is soluble in dilute or concentrated Potassium Hydroxide solutions, forming a red coloured liquid with green fluorescence; the *P.G.* states that when boiled with 2000 parts Water it does not completely dissolve and yields a filtrate which does not affect Litmus paper, and which is not affected by Ferric Chloride Test-solution. It dissolves to a reddish-yellow solution in concentrated Sulphuric Acid and is reprecipitated unchanged on dilution with Water. A carmine red colour should be assumed in the course of a day by Ammonia Solution which has been shaken with Chrysarobin. It may be distinguished from Chrysophanic Acid by mixing 1 mgm. with 2 drops of fuming Nitric Acid and adding Ammonia Solution, a violet coloration is produced, whereas Chrysophanic Acid produces a yellow coloured liquid; when Chrysarobin is shaken with Lime Water for a few minutes a violet coloration is imparted to the liquid. When heated in an open crucible it melts, and when ignited with free access of air it is officially required not to leave more than 1 p.c. of ash, the *P.G.* says 0·2 gramme should leave no weighable residue, the *U.S.P.* says it is entirely consumed.

Preparation.

UNGUENTUM CHRYSAROBINI. Chrysarobin Ointment.

2 of Chrysarobin dissolved in 48 of Benzoated Lard by the aid of heat, and subsequently stirred till cold. (1 in 25)

Official in U.S., 1 in about 17.

Not Official.

UNGUENTUM CHRYSAROBINI COMPOSITUM (*Unna*).—Chrysarobin and Ichthyol, of each, 5; Salicylic Acid, 2; Yellow Vaseline, 88.

PIGMENTUM CHRYSAROBINI.—Chrysarobin, 1; Gutta Percha solution, 9.—*Guy's.*

Chrysarobin, 60 grains; Chloroform, 10 drm.; pure Gutta Percha, 60 grains; dissolve. Painted on with a stiff brush. Acts effectually, and does not stain the linen.—*B.M.J.* '87, ii. 1139.

A 5 to 10 p.c. solution of Chrysarobin in equal parts of Chloroform and Glycerin. Used in ringworm; applied till erythema and a slight œdema are produced.—*B.M.J.* '04, i. 16.

Chrysarobin, 1; solution of Gutta Percha, *q.s.* to make 10.—*B.P.C.*

CHRYSAROBIN PLASTER MULLS (*Unna*).—Contain $\frac{1}{10}$ grain to the square inch; also five times this strength.

ANTHRAROBIN ($C_{14}H_{10}O_3$, eq. 224·38).—A yellow, or light yellowish-brown, odourless, tasteless powder. A reduction product from Alizarin. Slightly soluble in Water, but readily in Alcohol (90 p.c.) and solution of Borax.

Tests.—The aqueous solution yields with Lead Acetate solution a reddish-brown precipitate; with Ferric Chloride Solution, a brownish-violet precipitate. It dissolves in Sodium Hydroxide Solution (15 p.c.) with the production of a brownish-yellow colour which changes to violet on absorption of Oxygen from the air. It should leave not more than 2 p.c. of residue on incineration.

A substitute for Chrysarobin. For an **ointment** it is rubbed with Olive Oil and diluted with Lard.

Its action is similar to Chrysarobin, but it is slower and does not produce the same irritation. The part should be previously washed with Potash Soap, and the alcoholic **tincture** is preferred to the ointment. The strength of the ointment used is 1 in 10.—*B.M.J.* '88, i. 1234; *L.M.R.* '88, 234, and '89, 243.

Eurobin and **Lenirobin** are Chrysarobin Acetates, soluble in Acetone and Chloroform; they have been used for the same purposes as Chrysarobin. It is stated that they do not stain the normal skin, or the linen, like Chrysarobin.

CIMICIFUGÆ RHIZOMA.

CIMICIFUGA.

B.P.Syn.—Actææ Racemosæ Radix.

Fr., Racine d'Actée à Grappes; Ger., Schlangenwurzel.

The dried Rhizome and Roots of *Cimicifuga racemosa.*

The active principle is probably a resinous amorphous substance.

Medicinal Properties.—Bitter stomachic, analgesic. Given in neuralgia, myositis, rheumatism, lumbago, and sciatica. Relieves the pain of dysmenorrhœa and pleurodynia.

Official Preparations.—Extractum Cimicifugæ Liquidum, and Tinctura Cimicifugæ.

Not Official.—Cimicifugin.

Foreign Pharmacopœias.—Official in U.S. Not in the others.

Descriptive Notes.—The size of the official rhizome of *Cimicifuga racemosa*, Ell., is about ½ to 1 inch (12 to 25 mm.) in diameter and 2 to 6 inches (5 to 15 cm.) long, with slightly curved branches marked with transverse leaf scars, and the remains of ascending stems. In transverse section the large horny pith is surrounded by a zone of narrow woody wedges and large medullary rays, and a relatively thin bark. The rootlets, which are usually more or less broken off, show in transverse fracture about four woody wedges arranged like a Maltese cross, set in a dark cortical portion. The taste is bitter and acrid. It is sometimes confused with *Helleborus niger*, L., but that rhizome is smaller, $\frac{2}{10}$ to $\frac{3}{10}$ inch (5 to 7·5 mm.), and has more erect branches, with short woody wedges 8 to 12 in number and a thick bark, and the woody wedges in the roots taper outwards so that the central column has a cylindrical and stellate appearance.

Tests.—Cimicifuga may be distinguished from Black Hellebore by Ferric Chloride Test-solution; the *B.P.* says that the Rhizome and Roots are blackened by the reagent, but the colour is really a greenish-black. No official limit of ash is given, but it generally leaves about 5 to 7 p.c. of ash and it should not amount to more than 10 p.c.

Preparations.

EXTRACTUM CIMICIFUGÆ LIQUIDUM. LIQUID EXTRACT OF CIMICIFUGA. *B.P.Syn.*—LIQUID EXTRACT OF ACTÆA RACEMOSA.

20 of Cimicifuga percolated with Alcohol (90 p.c.) until exhausted, reserving the first 15, and evaporation of the further portion to a soft extract which is dissolved in the 15, and the whole made up to 20 with Alcohol (90 p.c.). (1 in 1)

Dose.—5 to 30 minims = 0·3 to 1·8 c.c.

Foreign Pharmacopœias.—Official in U.S.; also a powdered extract prepared by evaporation of the fluid extract and admixture with powdered Liquorice root. Not in the others.

Tests.—Liquid Extract of Cimicifuga has a specific gravity of 0·875 to 0·890; it contains from 8 to 10 p.c. w/v of total solids and about 80 p.c. w/v of Absolute Alcohol.

TINCTURA CIMICIFUGÆ. TINCTURE OF CIMICIFUGA. *B.P.Syn.*—TINCTURE OF ACTÆA RACEMOSA.

2 of Cimicifuga, in No. 40 powder, percolated with Alcohol (60 p.c.), to yield 20. (1 in 10)

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

The Tincture formerly in the *Companion* as 'Not Official' was twice the strength of this, and is still ordered as **Tinctura Actææ Racemosæ** (*Squire*) to distinguish it from the Official Preparation.

Foreign Pharmacopœias.—Official in U.S., 1 in 5. Not in the others.

Tests.—The specific gravity of the tincture should be between 0·918 to 0·925; it contains from 1·0 to 2·8 p.c. w/v of total solids and about 58 p.c. w/v of Absolute Alcohol.

Not Official.

CIMICIFUGIN.—A brown powder, a large proportion of which is soluble in Alcohol (90 p.c.).

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

It is stated in *U.S.D.* that it is an impure Resin obtained by precipitating a saturated tincture of the root with Water.

Not Official.

CINCHONÆ CORTEX.

CINCHONA BARK.

The dried Bark of *Cinchona Calisaya*, *C. officinalis*, *C. lancifolia*, and other species of *Cinchona*, from which the various alkaloids of the bark may be obtained.

The official salts of Quinine, which are Quininæ Hydrochloridum, Quininæ Hydrochloridum Acidum, and Quininæ Sulphas, may be prepared from the Bark of various species of Cinchona and Remijia.

Only Red Cinchona Bark is official for the galenical preparations.

Foreign Pharmacopœias.—Official in Austr., Dan., Jap., Norw., Russ. and Swed., any species, especially Succirubra; Dutch, Ger. and Swiss (Cinchona Succirubra); Fr. (Quinquina Jaune and Quinquina Rouge); Mex., any species; Hung., (China Calisaya and Succirubra); Port. (Cinchona Flava, Fusca and Rubra); Span. (Cinchona Calisaya, Peruviana and Succirubra); Belg., Swiss and Ital. (Cinchona Succirubra, Ledgeriana and Calisaya); U.S., any species of Cinchona, especially Ledgeriana, Calisaya and Officinalis; the latter used for Compound Tincture only.

CINCHONÆ RUBRÆ CORTEX.

RED CINCHONA BARK.

FR., QUINQUINA ROUGE; GER., CHINARINDE; ITAL., CHINA ROSSA; SPAN., QUINA ROJA.

The dried Bark of the stem and branches of cultivated plants of *Cinchona succirubra*, Pav.

The dried Bark of *Cinchona Succirubra* only is official in the *B.P.* and *P.G.* It is official also in the *U.S.P.* under the heading Cinchona Rubra; under Cinchona is given the dried bark of *Cinchona Ledgeriana*, Howard, *Cinchona Calisaya*, Wedd., *Cinchona officinalis*, L., and of hybrids of these with other species of Cinchona. The *B.P.* Bark when used for preparing the official galenical preparations is required to yield from 5 to 6 p.c. of total alkaloids, not less than half of which should consist of Quinine and Cinchonidine, as assayed by the process outlined below. This is not considered an exacting standard, as almost the whole of these mixed alkaloids might consist of Cinchonidine with a mere trace of Quinine, and it affords no criterion of the amount of Quinine present. It has been pointed out (*P.J.* (3) xvi. 407) that a bark may contain the requisite total alkaloids and the official percentage of Quinine and Cinchonidine, and still contain only a trace of Quinine; what, therefore, is really wanted in the *Pharmacopœia* is a Quinine standard for the Bark. The *French Codex* (1908) requires the Bark to contain at least 5 p.c. of total alkaloids and to yield at least 1·5 grammes of crystallised basic Quinine Sulphate containing 8 molecules of Water of crystallisation, this quantity corresponding to 1·257 p.c. of basic Quinine Sulphate, dried at 100° C. (212° F.), or to 1·092 p.c. of anhydrous Quinine. This is the first instance in which a Quinine standard has been adopted by an important Pharmacopœia. An outline of the process adopted for the determination of the alkaloids is too lengthy for inclusion here, but the essential details are given at the end of the Materia Medica. The galenical preparations of the *B.P.* are standardised to contain a definite percentage w/v of total alkaloids. The *U.S.P.* Succirubra Bark or its hybrids is required to yield not less than 5 p.c. of anhydrous Cinchona alkaloids when assayed by the process indicated for the other varieties of the Bark. The other varieties of Cinchona bark official in the *U.S.P.* are required to yield not less than 5 p.c. of total anhydrous Cinchona alkaloids, of which at least four-fifths shall consist of anhydrous Ether-soluble alkaloids. The galenical preparations of the *U.S.P.* are standardised to contain a definite percentage of Ether-soluble alkaloids.

The *P.G.* gives no definite requirement, but if the result of the volumetric determination be expressed in terms of the mean combining weights of Quinine and Cinchonidine it should yield not less than 5·07 p.c. of alkaloids. The new *Swiss Ph.* adopts a minimum of 6·5 p.c. of alkaloids.

Medicinal Properties.—Tonic, bitter stomachic and astringent. It is valuable in neuralgia and in convalescence from acute diseases; in diarrhœa, excessive perspiration, chronic discharges from mucous membranes, and in dipsomania. (*See* also *Quinine.*)

Official Preparations.—Extractum Cinchonæ Liquidum, Infusum Cinchonæ Acidum, Tinctura Cinchonæ, Tinctura Cinchonæ Composita; and is a source of the Alkaloid Quinine.

Not Official.—Decoctum Cinchonæ, Elixir Cinchonæ, Mistura Cinchonæ, Mistura Cinchonæ Acida, Sirop de Quinquina, Tinctura Chinæ Composita, Vinum Chinæ, also Ferratum, Cinchonidinæ Hydrobromidum, Cinchonidinæ Sulphas, Cinchoninæ Iodo-Sulphas, Cinchoninæ Sulphas, and Acidum Chinicum.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Descriptive Notes.—Red Cinchona bark is now chiefly imported from Ceylon and Java, although some is occasionally offered from the African Island of St. Thomé. The tree grows rapidly, and consequently the bark shrinks a good deal in drying, and presents, especially in the branch bark, a shrivelled or longitudinally wrinkled character; it has a reddish colour when broken, and a bitter and astringent taste. Its most marked feature is the presence of reddish warty lenticels. In the variety with leaves hairy beneath, formerly cultivated in Jamaica, these occur very sparingly. These two characters distinguish the red Cinchona from the other barks in use, since the warts are absent in that of *C. Calisaya*, Wedd., and in it the ridges or wrinkles are replaced by longitudinal fissures, which are at first shallow, but become deeper in older barks, and the epidermal layer often exfoliates, showing transverse cracks in the layer beneath. The variety *Ledgeriana*, Howard, is remarkable for its relatively greater thickness as compared with that of other species, but externally resembles Calisaya, except that the surface is usually rougher. In *Cinchona officinalis*, Hook., there are numerous transverse cracks with thickened edges, broken into points, so that the bark is rougher to the touch than other kinds. *Cinchona lancifolia*, Mutis., and its varieties are characterised by a whitish spongy epidermal layer and by a loose fibrous fracture. A hybrid of *C. officinalis*, L., and *C. succirubra*, Pav. (*Cinchona robusta*, Hort.), presenting the thick-edged cracks of the one and the warty character of the other, is remarkably rich in alkaloid, and is sometimes offered as 'Ledgeriana' bark. Small chips of red barks obtained by spoke-shaving do not present marked characters, and should only be purchased on analysis. The official bark is in quills or somewhat curved pieces coated with periderm; it may vary considerably in length, 2 to 12 in. (5 to 30 cm.) or more, and the thickness of the bark itself may vary from about $\frac{1}{10}$ to $\frac{1}{4}$ in. ($2\frac{1}{2}$ to 6 mm.); the fracture is shortly fibrous in the smaller, and finely fibrous in the larger pieces; the powder should be brownish or reddish-brown.

Tests. Cinchona is one of the few instances in which the *B.P.* adopts a standard for the drug and indicates a method for the determination of its alkaloidal strength. The process official in the *B.P.* 1898 is an adaptation of that of the *B.P.* 1885, which is in turn based upon a process recommended by Squibb, it depends upon the liberation of the alkaloids from the combinations in which they exist in the bark by means of Calcium Hydroxide and their extraction by means of a mixture of 3 parts by volume of Benzol and 1 part by volume of Amyl Alcohol, the alkaloids in turn being shaken out from this solvent by a mixture of Diluted Hydrochloric Acid, and Water, which solution, after careful neutralisation with Ammonia Solution, is concentrated and the Quinine and Cinchonidine precipitated by Sodium Potassium Tartrate Solution; the Tartrates of the remaining alkaloids being precipitated from the filtrate from the Quinine and Cinchonidine by the addition of a slight excess of Ammonia Solution. The *B.P.* process may be briefly outlined as follows: A weighed quantity (20 grammes) of the finely powdered Bark is treated with 6 grammes of Calcium Hydroxide. The mixture after being moistened with 20 c.c. of Water is thoroughly incorporated, and allowed to stand for an interval of one or two hours. It is then transferred to a flask, mixed with 130 c.c. of a mixture of 3 parts by volume of Benzol and 1 part by volume of Amyl Alcohol and extracted by boiling under a reflux condenser for about 30 minutes. The Benzolated Amyl Alcohol is removed, passed through a filter, and the residue in the flask again boiled with a further quantity of the same mixture of Benzol and Amyl Alcohol, the liquid removed as before, and the process repeated a third time if necessary, the residue in the flask being finally transferred to the filter and washed by percolation with the mixture of Benzol and Amyl Alcohol until exhausted of alkaloids. This may be determined by evaporating a few drops of the Benzol-Amyl Alcohol Solution on a watch-glass, acidifying the residue with a drop or two of Diluted Sulphuric Acid, and adding a drop or two of Potassio-mercuric Iodide (Mayer's) Solution. The filtrates are mixed, transferred to a separator, and well shaken whilst warm with a mixture of 2 c.c. of Diluted Hydrochloric Acid and 12 c.c. of Water the liquids are allowed to separate, the acid aqueous solution of the alkaloidal Hydrochlorides is removed and the extraction of the alkaloids remaining in the Benzolated Amyl Alcohol solution accomplished by repeatedly shaking with Water made slightly acid with Hydrochloric Acid. The mixed acid liquids should, whilst warm, be exactly neutralised with Ammonia Solution concentrated to a volume of 16 c.c., and the Quinine and Cinchonidine precipitated as tartrates by the addition of a solution of about 1·5 grammes of Sodium Potassium Tartrate dissolved in 3 grammes of Water, the whole well stirred with a glass rod, and allowed to remain at rest for about an hour. The precipitated Quinine and Cinchonidine Tartrates are filtered, washed, dried at a temperature of the water-oven and weighed. They should contain four-fifths of their weight of alkaloids, and if this quantity be multiplied by 5 the product will be percentage by weight of Quinine and Cinchonidine.

The filtrate from the Quinine and Cinchonidine Tartrates is made slightly alkaline by the addition of Ammonia Solution, the precipitate collected on a filter, washed, dried, presumably also at a temperature of the water-bath, and weighed. This precipitate consists of the alkaloids other than Quinine and Cinchonidine, and if their weight be multiplied by 5 the product represents the percentage by weight present in the Bark, and when added to that of the Quinine and Cinchonidine obtained by the previous process yields the percentage by weight of total alkaloids.

The *B.P.* process is lengthy and tedious, it requires careful manipulation, and the closest attention to details is necessary to obtain accurate results. The exhaustion of Bark by the hot Benzolated Amyl Alcohol requires considerable time and patience. The exact neutralisation of the Hydrochloric Acid solution of the alkaloids requires great care, as does also the evaporation of the solution to the prescribed volume, and after evaporation the reaction of the liquid should again be ascertained and if necessary again exactly neutralised, unless exactly neutral there will be a liability to loss of alkaloid. It by no means follows that although the liquid has been neutralised before evaporation it will remain neutral during evaporation, and a further addition of Ammonia Solution is generally necessary.

The *U.S.P.* employs Ether-chloroform as a solvent for the alkaloids, and divides the process into two parts: (1) for anhydrous Cinchona alkaloids, and (2) for Ether-soluble alkaloids. The outlines of the process are essentially as follows:—A weighed quantity of 15 grammes of Cinchona Bark in No. 80 powder (or finer) is shaken vigorously in an Erlenmeyer flask with a mixture of 250 c.c. of Ether and 50 c.c. of Chloroform, and allowed to stand for 10 minutes. A measured quantity of 10 c.c. of Ammonia Solution is added, and, with frequent intervals of shaking, the mixture is allowed to stand for 5 hours. A measured quantity of 15 c.c. of Water is added, the mixture vigorously shaken and allowed to stand a few minutes. A measured quantity of 200 c.c. of the clear supernatant liquid is then transferred to a separator and the alkaloids extracted by vigorously shaking with 15 c.c. (or sufficient to make the liquid distinctly acid) of Normal Volumetric Sulphuric Acid Solution. The lower acid liquid is drawn off after the two layers have been separated, and the Ether-chloroform solution is again shaken vigorously, with a mixture of 5 c.c. of Normal Sulphuric Acid and 5 c.c. of Water; after separation, the acid liquid is again removed; the shaking is repeated a third time, using 5 c.c. of Water only, and the aqueous liquid is removed. The mixed acid liquids are filtered into a graduated cylinder, the containing vessel and filter are washed with sufficient Water to bring the volume of the contents of the cylinder to 50 c.c., and this measured quantity is then divided into two equal portions of 25 c.c. each. No. 1 quantity of 25 c.c. is placed in a separator, is rendered alkaline by a sufficiency of Ammonia Solution, and the alkaloids removed by shaking carefully for 1 minute with a mixture of 3 volumes of Chloroform and 1 volume of Ether. The lower layer, after separation of the liquids is complete, is drawn off into a tared flask. The contents of the separator are again shaken with 20 c.c. of a similar mixture of Chloroform and Ether for 1 minute, and this is followed by a third shaking with 10 c.c. of the Chloroform-ether mixture; the chloroformic liquids being in each case removed after the liquids have separated into two layers. The mixed Chloroform-ether solutions are evaporated to dryness on a water-bath, the dried residue is mixed with 3 c.c. of Ether, and again evaporated to dryness. It is then dried in an air-bath at a temperature of 110° C. (230° F.) until the weight remains constant. This weight multiplied by 20 indicates the percentage by weight of total Cinchona alkaloids. The second quantity of 25 c.c. is rendered alkaline with a sufficiency of Ammonia Solution, and shaken moderately for 2 minutes with 25 c.c. of Ether, the temperature of the liquid being maintained below 20° C. (68° F.), and the liquids allowed to stand for 10 minutes at 15° C. (59° F.). After separation of the two liquids the aqueous layer is removed and the ethereal solution is transferred to a tared flask. The separator is rinsed out with 5 c.c. of Ether and the washings added to the main quantity. The Ether is carefully evaporated on a water-bath, the flask and contents dried for 2 hours at a temperature of 110° C. (230° F.), cooled and weighed. The weight multiplied by 20 yields the percentage by weight of anhydrous Ether-soluble alkaloids. The *U.S.P.* adds a note to the effect that the Ether-soluble alkaloids include Quinine, Quinidine, and Cinchonidine.

The above process works well, is easily manipulated and yields the alkaloids in a very fair state of purity. Determinations carried out in the author's laboratory have shown an average of about 5·84 p.c. of total alkaloids and 4·32 p.c. of Ether-soluble alkaloids.

The *P.G.* describes a method for the determination of the percentage of total alkaloids, but gives no process by which the amount of Quinine and Cinchonidine may be judged. A qualitative test is introduced, which requires that 5 c.c. of the reserve portion remaining after the quantity for the volumetric determination has been removed, when mixed with 1 c.c. of Chlorine Water, shall, on the addition of Ammonia Water, yield a fine green coloration.

The process for the quantitative volumetric determination of the alkaloids is as follows:—A weighed quantity of 12 grammes of the finely powdered Bark dried at 100° C. (212° F.) is mixed in a well-stoppered flask or bottle with 90 grammes of Ether and 30 grammes of Chloroform, a measured quantity of 10 c.c. of Sodium Hydroxide solution (15 p.c.) is added, and with frequent intervals of vigorous shaking the mixture is allowed to stand for 3 hours. A measured quantity of 10 c.c. of Water, or sufficient to cause the powdered Bark to agglomerate on shaking, is added, and after the Chloroform-ether solution has separated as a clear supernatant liquid, a weighed quantity of 100 grammes is filtered through a dry well-covered filter into a flask, and half of the liquid distilled; the remainder is transferred to a separator, the flask is washed out with three successive quantities of 5 c.c. of a mixture of 3 parts by weight of Ether and 1 part by weight of Chloroform, and the alkaloids are extracted from the mixed Chloroform-ether liquids by agitation with 25 c.c. of Deci-normal Volumetric

Hydrochloric Acid Solution. The acid layer is drawn off after the liquids have completely separated and after sufficient Ether has been added to the mixture to cause the Chloroform-ether layer to float on the acid liquid, it is filtered through a small paper moistened with Water, into a flask of 100 c.c. capacity. The extraction of the Chloroform-ether solution is thrice repeated, using 10 c.c. of Water for each extraction, and the separated aqueous liquids are passed through the same filter paper; the latter is washed with Water, and the mixed filtrates and washings are diluted to 100 c.c. A measured quantity of 50 c.c. is removed, a freshly prepared solution of a small crystal of Hæmatoxylin in 1 c.c. of Alcohol (90 p.c.) added, and sufficient Deci-normal Volumetric Potassium Hydroxide Solution added to change the yellow colour to a bluish-violet, the mixture being shaken after each addition. Not more than 4·3 c.c. should be necessary. No factor is recorded by which the result of the above volumetric test may be calculated into its equivalent in alkaloids. Assuming that the mixture contains equal proportions of Quinine and Cinchonidine, a factor of 0·030931 may be employed, which indicates 5·07 p.c. of alkaloids. That the alkaloids are not always present in these proportions is evidenced by the observed discrepancies between the results of gravimetric and volumetric determinations. The new *Swiss Ph.* states that 1 c.c. of Deci-normal Volumetric Hydrochloric Acid is equivalent to 30·4 mg. of alkaloids.

The use of Hydrochloric Acid for the titration of Quinine instead of Sulphuric Acid eliminates the troublesome fluorescence which is produced when the alkaloid is taken into solution in the latter acid, and which may often seriously interfere with the end reaction. It must be borne in mind that the behaviour of Quinine towards certain indicators of neutrality is somewhat anomalous. With Hæmatoxylin or Cochineal the point of neutrality is reached with the formation of the Hydrochloride ($C_{20}H_{24}N_2O_2HCl$), but this salt is alkaline in reaction towards Methyl Orange, and the point of neutrality with this indicator is only reached with the formation of the Acid Hydrochloride ($C_{20}H_{24}N_2O_2, 2HCl$). Thus, using Hæmatoxylin Solution as an indicator, 1 c.c. of Deci-normal Volumetric Hydrochloric Acid Solution is equivalent to 0·03218 gramme of anhydrous Quinine, whilst using Methyl Orange Solution 1 c.c. of the Deci-normal Volumetric Solution is equivalent to 0·01609 gramme of anhydrous Quinine. The behaviour of Cinchonine and Cinchonidine towards these indicators is still more anomalous. It may therefore be doubted whether the application of a purely volumetric method of determination is advisable, and the volumetric result should always be controlled by a gravimetric determination.

The ash varies from 2 to 4 p.c.

Preparations.

EXTRACTUM CINCHONÆ LIQUIDUM. Liquid Extract of Cinchona.

A dark reddish-brown liquid prepared from Red Cinchona Bark by treatment with Distilled Water acidulated with Hydrochloric Acid and containing a small proportion of Glycerin; it is officially required to contain 5 p.c. w/v or 5 grains of Red Cinchona alkaloids in 110 minims; the *U.S.P.* Fluid Extract is required to contain 4 p.c. w/v or 4 grains of anhydrous Ether-soluble alkaloids in 110 minims. A fluid extract does not appear in the *P.G.*, which, however, has two solid extracts, an aqueous and an alcoholic.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

22 minims contain 1 grain of alkaloids.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Jap., Mex., Norw., Swed., Swiss and U.S., 1 in 1; Solid Extracts.—Austr. and Hung., Aqueous; Belg., Dutch, Ital., Jap., Mex., Russ., Span. and Swiss, Alcoholic; Fr., Ger., Mex. and Port., both Aqueous and Alcoholic. Belg. has also Chinæ Fluidextractum cum Kalio Iodati. Not in the others.

Tests.—The specific gravities of commercial fluid extracts of Red Cinchona Bark vary between 1·100 and 1·150; the percentage w/v of total solids from 33·4 to 53·0 p.c. and the percentage w/v of total alkaloids from 4·6 to 5·46 p.c. One commercial fluid extract, purchased as *B.P.*, assayed in the author's laboratory, possessed a specific gravity of 1·080, contained 27·5 p.c. w/v of total solids and only 2·6 p.c. of total alkaloids.

The *B.P.* adopts a standard of total alkaloids, the *U.S.P.* of anhydrous Ether-soluble alkaloids; the former Pharmacopœia employs a mixture of 3 parts by volume of Benzol and 1 part by volume of Amyl Alcohol for the initial extraction of the alkaloids, the latter a mixture of Ether and Chloroform.

The outlines of the official process are essentially as follows:—A measured quantity of 5 c.c. of the Liquid Extract is diluted with five times its volume of Water, introduced into a separator, rendered alkaline with 15 c.c of Potassium Hydroxide Solution, and the liberated alkaloids extracted by well shaking the mixture with 30 c.c. of a mixture of 3 parts by volume of Benzol and 1 part by volume of Amyl Alcohol; the Benzol-Amyl Alcohol solution is transferred to another separator and the agitation repeated with another 30 c.c. of a similar mixture, the Benzol-Amyl Alcohol layer being again drawn off into the second separator; the mixed Benzol-Amyl Alcohol liquids are washed with a little Water, the aqueous washings rejected, and the alkaloids extracted with 30 c.c. of a warm mixture of 1 volume of Diluted Hydrochloric Acid and 5 volumes of Water, the acid solution of the alkaloidal Hydrochlorides is separated, and the extraction repeated with a further 30 c.c. of a similar mixture of acid and Water. The mixed acid liquids are rendered strongly alkaline with Ammonia Solution, and the liberated alkaloids extracted by agitation with three successive quantities of 10 c.c. of Chloroform, the chloroformic layers are in each instance separated, mixed, transferred to a weighed dish, the Chloroform evaporated slowly, and the residue dried at 110° C. (230° F.). This weight multiplied by 10 gives the percentage by volume of total alkaloids present in the sample. The *B.P.* process is stated (*Y.B.P.* '05, 362) to give rise to obstinate emulsions, which may be overcome by using 10 c.c. alcoholic, in place of 15 c.c. of aqueous, Potassium Hydroxide solution. A suggestion is also made to weigh instead of to measure the quantity of Liquid Extract.

The *U.S.P.* process is carried out on the following lines:—A measured quantity of 10 c.c. of the Fluid Extract is introduced into an Erlenmayer flask, rendered alkaline by the addition of 10 c.c. of Ammonia Solution, and the alkaloids extracted by shaking vigorously for 10 minutes with a mixture of 100 c.c. of Ether and 25 c.c. of Chloroform. 66 c.c. of the clear supernatant liquid is transferred to a separator, the vessel in which the liquid is measured being washed out with 5 c.c. of Ether, which is in turn added to the contents of the separator. The alkaloids are then removed from the Ether-Chloroform solution by shaking it vigorously for several minutes with a sufficiency (10 c.c.) of Normal Volumetric Sulphuric Acid Solution, and the acid layer is transferred into another separator. The complete extraction of the alkaloids from the Chloroform-Ether solution is ensured by a further extraction with 5 c.c. of Normal Volumetric Sulphuric Solution and 5 c.c. of Water, which is in turn followed by an extraction with 5 c.c. of Water. The acid aqueous and the aqueous liquids are separated, mixed with the acid layer already contained in the second separator, the temperature of the mixed liquids being maintained below 25° C. (77° F.), 25 c.c. of Ether added and sufficient Ammonia Solution to yield an alkaline reaction to red Litmus paper; after vigorous agitation for 2 minutes the temperature is reduced to below 15° C. (59° F.), and the liquids allowed to stand for 10 minutes at that temperature. The ethereal layer is separated, transferred to a tared flask, the separator washed with 5 c.c. of Ether, the washings being added to the main quantity, and the Ether evaporated at a moderate heat on a water-bath, the residue being dried for half an hour in an air-bath at 110° C. (230° F.), cooled and weighed, the heating being repeated and the weight taken when constant. The weight of this residue multiplied by 20 gives the percentage w/v of anhydrous Ether-soluble alkaloids present in the Fluid Extract.

The process has been tried in the author's laboratory, and works well; the resulting alkaloids are fairly free from colour; the average percentage of anhydrous Ether-soluble alkaloids in commercial Fluid Extracts was found to be 4·5 p.c.

INFUSUM CINCHONÆ ACIDUM. Acid Infusion of Cinchona.

Red Cinchona Bark, 1; Aromatic Sulphuric Acid, $\frac{1}{4}$; Distilled Water, boiling, 20; infuse for one hour, and strain. (1 in 20)

Dose.—$\frac{1}{2}$ to 1 fl. oz. = 14·2 to 28·4 c.c.

Foreign Pharmacopœias.—Official in Russ. (C. Rubra), 1 in 8, with Phosphoric Acid; Fr. (Tisane), 1 in 50; Span., 1 in 33$\frac{1}{3}$, with Acidum Sulphuricum Alcoholisatum. Not in the others.

TINCTURA CINCHONÆ. Tincture of Cinchona.

A clear reddish or brownish-red liquid, prepared by treating red Cinchona bark, in No. 40 powder, with sufficient Alcohol (70 p.c.) to form a tincture which shall contain not less than 0·95 nor more than

1·05 p.c. w/v of total alkaloids. The *U.S.P.* Tincture is required to contain 0·75 p.c. w/v anhydrous Ether-soluble alkaloids. The *P.G.* tincture is calculated to contain about 1 p.c. w/v of total alkaloids.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

22 minims contain ⅕ grain of alkaloids.

Foreign Pharmacopœias.—Official in Fr., Teinture de Quinquina Rouge; Dan., Norw., Russ. and Swed., Tintura Chinæ (from any species); Dutch and Ger., Tinctura Chinæ, and Hung., Tinctura Chinæ Simplex (from C. Succirubra); Ital., Tintura di China; Jap., Tinct. Chinæ; Mex., Tintura de Quina; Port., Tintura de Quina (from C. Flava); Span., Tintura Alcoholica de Quina (from C. Calisaya and C. Loja); Swiss, Tinctura Cinchonæ; U.S., Tinctura Cinchona (C. any species not Red); all 1 in 5, and all by weight, except U.S. Not in Austr. Belg. (C. various species, especially Succirubra), contains 1 p.c. w/w total Alkaloids, including at least 0·2 p.c. Quinine. U.S., Cinchona (*U.S.P.*), in No. 60 powder, 200; Glycerin, 75; and sufficient of a mixture of Alcohol (95 p.c.) 675, with Water 250, to produce 1000 by percolation, containing 0·75 p.c. w/v Ether-soluble Alkaloids.

Tests.—Tincture of Cinchona has a specific gravity of 0·915 to 0·920; contains from 3·5 to 8·5 p.c. w/v of total solids and from 62·5 to 66·5 p.c. w/v of Absolute Alcohol. The *B.P.* requires that 10 c.c. of Tincture, when assayed according to the process described in the large type under Extractum Cinchonæ Liquidum, shall yield not less than 0·095 gramme nor more than 0·105 gramme of alkaloids. The *U.S.P.* standardises the Tincture to a percentage w/v of anhydrous Ether-soluble alkaloids. A measured quantity (50 c.c.) of the Tincture is evaporated to about one-fifth its volume on a water-bath, the liquid transferred to a bottle of about 180 c.c. capacity, the dish rinsed with 10 c.c. of diluted Alcohol, and the determination completed as in the case of the fluid extract. The weight of anhydrous Ether-soluble alkaloids obtained, multiplied by 4, shows the percentage w/v present in the Tincture.

TINCTURA CINCHONÆ COMPOSITA. Compound Tincture Cinchona.

A brownish-red liquid possessing an aromatic odour and bitter taste, which is officially required to contain not less than 0·45 nor more than 0·55 p.c. w/v of the total alkaloids of Red Cinchona Bark, when assayed as described below. The Compound Tinctures official in the *U.S.P.* and *P.G.* are prepared from Red Cinchona Bark containing the official percentage of alkaloids required by each Pharmacopœia, but the alkaloidal content is not verified by a determination. *See* also below.

Tincture of Cinchona, 20 fl. oz.; Dried Bitter-Orange Peel, well bruised, 2 oz.; Serpentary Rhizome, in No. 40 powder, 1 oz.; Cochineal, in powder, 56 grains; Saffron, 110 grains; Alcohol (70 p.c.), *q.s.* to yield 40 fl. oz.

Made with standardised Tincture of Cinchona instead of the Red Cinchona Bark ordered in the previous edition of *B.P.*

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

22 minims contain $\frac{1}{10}$ grain of alkaloids.

Foreign Pharmacopœias.—Official in Austr., Ger., Hung., Jap. and Russ., Tinct. Chinæ Comp., also Swiss (Tinct. Cinch. Co.), with Cinchona, Gentian, Orange Peel and Cinnamon (various strengths); Belg. (Tinct. Whyttii or Tinct. Huxham), Cinchona, Orange Peel, Cinnamon and Saffron; Dan., Dutch, Norw. and Swed. (Tinct. Chinæ Comp.), similar to the above but without Cinnamon; Mex. (Tintura de Quina Compuesta), and Span. (Tinctura Alcoholica de Corteza de Naranja Compuesta, Tintura corroborante de Whytt.), Bitter-Orange Peel, Cinchona and Gentian; Port. (Tinct. de Quina Comp.), Cinchona, Orange Peel and Serpentary; U.S., Red Cinchona (*U.S.P.*), 100; Bitter-Orange Peel, 80; Serpentaria, 20; Glycerin, 75; and sufficient of a mixture of Alcohol (95 p.c.) 675, with Water 250, to produce 1000 by percolation. Not in Fr.

Huxham's Tincture of Bark (Original Formula in 1788).—Powdered Peruvian Bark, 4 oz.; Orange Peel, 3 oz.; Serpentary Root, 80 grains; Saffron, 160 grains; Cochineal, 80 grains; Brandy, 40 fl. oz.; digest 3 or 4 days.

Tests.—Compound Tincture of Cinchona possesses a specific gravity of 0·910 to 0·920; contains about 5 p.c. w/v of total solids and about 63·0 p.c. w/v of Absolute Alcohol. A measured quantity of 10 c.c., when assayed by the official process as outlined in the large type under Extractum Cinchonæ Liquidum, should yield an amount of alkaloids corresponding to not less than 0·45 nor more than 0·55 p.c. w/v of total alkaloids. Neither the *U.S.P.* nor the *P.G.* gives a process for the determination of the alkaloids, the presence of the soluble principles from the other constituents of the Tincture invalidating the results.

The residue obtained by the evaporation to dryness of 2 c.c. of the *B.P.* Compound Tincture should impart a yellow colour to Chloroform, and if the chloroformic solution be filtered and evaporated to dryness, the residue when moistened with a drop of concentrated Sulphuric Acid will acquire a beautiful indigo-blue tint, indicating the presence of Saffron. The *U.S.P.* and *P.G.* Compound Tinctures are made from Red Cinchona Bark, and do not contain Saffron.

Not Official.

DECOCTUM CINCHONÆ.—Red Cinchona Bark, in No. 20 powder, 1¼; Distilled Water, 20; boil 10 minutes; when cold, strain, and pour on the marc sufficient Water to make 20. (1 in 16)

Dose.—1 to 2 fl. oz. = 28·4 to 56·8 c.c.

Official in Belg., 1 of Fluid Extract in 10; Dan., 1 in 8 with Hydrochloric Acid; Dutch, 6 in 100; Ital., 1 in 20; Norw. and Swed., 1 in 10 with Hydrochloric Acid; Port., Cinchona Flava 1 in 10, also Fusca 1 in 10; Russ., Cinchona Rubra, 1 in 7·5, containing Sulphuric Acid; Span., Cocimento de Quina Calisaya and Cocimento de Quina de Loja, each about 1 in 66; also Cocimento de Quina y Valeriana and Cocimento Antiseptico; Dan. and Norw. have a Dec. Chinæ c. Senega.

ELIXIR CINCHONÆ (*U.S.N.F.* 1896).—Tincture of Cinchona, 12; Syrup, 10; Glycerin, 10; Aromatic Elixir, 48. Each fl. oz. represents about 14 grains of Yellow Cinchona. A similar preparation is made with Detannated Tincture of Cinchona for use in combination with preparations of Iron.

This has been adopted by the *B.P.C.*, but in the latest edition of *U.S.N.F.* (1906) the preparation is made with the alkaloids, and not with Tincture of Cinchona.

MISTURA CINCHONÆ (*for children*).—Diluted Nitric Acid, 30 minims; Tincture of Cinchona, 2 fl. drm.; Glycerin, 1 fl. drm.; Distilled Water, to 1½ fl. oz. —*Middlesex.*

Dose.—1 to 2 fl. drm.

MISTURA CINCHONÆ ACIDA.—Liquid Extract of Cinchona, 10 minims; Diluted Nitric Acid, 10 minims; Aromatic Syrup, 30 minims; Water, to 1 fl. oz.—*St. Thomas's.*

This formula has been incorporated in the *B.P.C.*

Liquid Extract of Cinchona, 10 minims; Diluted Nitric Acid, 10 minims; Aromatic Syrup, 60 minims; Water, to 1 fl. oz.—*Brompton.*

Other hospitals include Mistura Cinchonæ Acida, but they are made with Decoctum Cinchonæ.

SIROP DE QUINQUINA.—Percolate 1000 of Red Cinchona in No. 26 powder with 1000 of Alcohol (30 p.c.); displacing with Water to obtain 1000 of percolate; distil off 445 and dissolve in the residue when cold 1000 of Sugar.—*Fr.*

TINCTURA CHINÆ COMPOSITA.—Cinchona Bark, 6; Orange Peel, 2; Gentian Root, 2; Cinnamon Bark, 1; Diluted Spirit (60 p.c.), 50.—*Ger.*

VINUM CHINÆ (*Ger.* and *Jap.*).—Dissolve Gelatin, 1, in warm Water, 10; mix with Sherry, 1000; add powdered Cinchona Bark, 40; allow to stand for eight days at 15° to 20° C. Press, and to the expressed liquor add Sugar, 100; Tincture of Orange, 2; allow to stand in a cool place for fourteen days, and filter.

Austr., Vinum Chinæ.—Dissolve 1 of Gelatin in 20 of boiling Water, and mix with 780 of Malaga Wine; after 24 hours, add 50 of Fluid Extract of Cinchona, 50 of Tincture of Orange, and 100 of Clarified Honey.

Belg., Chinæ Vinum.—1 of Fluid Extract in 50 of stronger Wine.

Fr., Vin de Quinquina Officinal.—Cinchona, 25; Alcohol (60 p.c.), 75; Dilute Hydrochloric Acid, 2; Red Wine, 920.

Dutch, Vinum Chinæ.—1 Cinchona Succirubra percolated with a mixture of 1 of diluted Alcohol, 4 of Malaga Wine, and 3 of Water *q.s.* to produce 40, in which dissolve 10 of Sugar.

Hung., Vinum Chinæ.—Extract of Cinchona, 1; Malaga Wine, 80; Simple Tincture of Cinchona, 20.

Ital., Vino Chinato.—Cinchona, 1; Marsala Wine, 30.

Mex., Vino de Quina.—Cinchona, 3; Sherry Wine, 100.

Norw., Vinum Chinæ.—Cinchona, 50; Citric Acid, 1; Alcohol, 20; Malaga Wine, 1000.

Russ., Vinum Chinæ.—Tincture of Cinchona, 1; Sherry Wine, 4.

Port., Vino de Quina.—Cinchona flavum, 1; Port Wine, 20; Vinho de Quina Cinzenta, Cinchona fuscum, 1; Madeira Wine, 10; Vinho de Quina Composto, Cinchona flavum, 4; Gentian, 1; Bitter-Orange Peel, 1; Port Wine, 100; Vinho de Quina Ferruginoso, Iron and Potassium Tartrate, 1; Vinho de Quina Cinzenta, 200.

Span., Vino de Quina.—Loja Bark, 1; Sherry Wine, 16·6; Vino de Quina Ferruginoso, Crystallised Ferrous Sulphate and Citric Acid, of each, 1; Distilled Water, 10; Quinine Wine, 500.

Swiss, Vinum Cinchonæ.—30 of Fluid Extract, 20 of diluted Alcohol, 40 of Milk, 1 of Citric Acid, 910 of Malaga Wine.

B.P.C., Vinum Cinchonæ.—Elixir Cinchona, 1; Detannated Sherry, to make 8.

Dutch, Vinum Chinæ Ferratum.—1 of Ferri Pyrophosphate with Ammonium Citrate, dissolved in 4 of Water, and added to 95 of Cinchona Wine.

Austr., Vinum Chinæ Ferratum.—1 of Gelatin, dissolved in 20 of boiling Water, is added to 955 of Malaga Wine; after 24 hours, add 5 of Iron and Quinine Citrate dissolved in 20 of Water.

Norw., Vinum Chinæ Ferratum.—Iron and Ammonium Citrate, 1; Cinchona Wine, 100.

Swed., Vinum Chinæ Ferratum.—Iron and Quinine Citrate, 1; Syrup, 10; Marsala Wine, 89.

B.P.C., Vinum Cinchonæ Ferratum.—Iron and Ammonium Citrate, 1; Cinchona Wine, 200.

CINCHONIDINÆ HYDROBROMIDUM ($C_{19}H_{22}N_2O$, HBr, H_2O, eq. 390·28).—Long, light yellow, odourless prismatic crystals, possessing a very bitter taste. It contains 74·83 p.c. of Cinchonidine and 4·58 p.c. of Water. Soluble 1 in 40 of Water. Under the name of 'Blennostasine,' a combination similar to this has been introduced for the treatment of affections characterised by catarrhal hypersecretion.

Tests.—An aqueous solution of the salt yields with Potassium Sodium Tartrate solution a white precipitate soluble in diluted Hydrochloric Acid; with Ammonia Solution it yields a white precipitate soluble in Chloroform. The aqueous layer when separated from the Chloroform and rendered faintly acid with Nitric Acid yields with Silver Nitrate Solution a yellowish curdy precipitate soluble with difficulty in Ammonia Solution, insoluble in Nitric Acid.

When ignited with free access of air 0·5 gramme of the salt should leave no weighable residue.

An aqueous solution should yield no precipitate on the addition of a solution containing a soluble Sulphate.

CINCHONIDINÆ HYDROBROMIDUM ACIDUM ($C_{19}H_{22}N_2O$, $2HBr$, $2H_2O$, eq. 488·51).—Light yellow prismatic crystals, readily soluble in Water. It should contain 59·78 p.c. of Cinchonidine and 7·32 p.c. of Water.

Tests.—An aqueous solution of the acid salt responds to tests described under Cinchonidine Hydrobromide.

The aqueous solution should yield no precipitate on the addition of a solution of a soluble Sulphate.

When ignited with free access of air 0·5 gramme of the salt should leave no weighable residue.

CINCHONIDINÆ SULPHAS $(C_{19}H_{22}N_2O)_2$, H_2SO_4, $3H_2O$, eq. 735·08.—Colourless, odourless, silky, acicular crystals, having a very bitter taste. It contains 79·46 p.c. of Cinchonidine and 7·29 p.c. of Water.

In doses of one-and-a-half to twice those of Quinine, is stated to form a reliable substitute and frequently to be better tolerated.—*Pr.* lxxiii. 682.

Solubility.—1 in 100 of Water, 1 in 60 of Alcohol (90 p.c.); insoluble in Chloroform and Ether.

Dose.—1 to 10 grains = 0·06 to 0·65 gramme.

Foreign Pharmacopœias.—Official in Fr. and U.S. Not in the others.

The salt is capable of forming a number of Hydrates, according to the strength of solutions from which it is crystallised. From a moderately concentrated solution it crystallises with $6H_2O$, from a hot concentrated solution it crystallises with $3H_2O$. The formula for the salt official in the *French Codex* (1908) shows 6 molecules of Water of crystallisation, which is equivalent to 13·6 p.c. of Water. It contains 74·06 p.c. of Cinchonidine.

Tests. — Cinchonidine Sulphate loses its Water at 100° C. (212° F.), and the anhydrous salt reabsorbs moisture on exposure to moist air. It has a melting point of 205° to 206° C. (401° to 402·8° F.), slightly below which temperature it darkens in colour. An aqueous solution of the salt is neutral in reaction towards Litmus paper, and yields on the addition of Ammonia Solution a white precipitate, only slightly soluble in an excess of the reagent, but soluble in Ether, a portion of the salt subsequently crystallising out. Another portion of the aqueous solution, acidified with diluted Hydrochloric Acid, yields with Barium Chloride Solution a white precipitate insoluble in Hydrochloric or Nitric Acids.

The more generally occurring impurities are excess of Water, readily carbonisable organic impurities, Quinine or Quinidine Sulphates, Cinchonine Sulphate, and mineral matter. Excess of Water is readily detected by the loss of weight of the specimen at a temperature of 100° C. (212° F.). The theoretical percentage of Water in the $3H_2O$ salt is 7·29 p.c. The salt should not lose more than 8 p.c. when dried at this temperature. The $6H_2O$ salt of the *Fr. Codex* (1908) loses 13·6 p.c. Readily carbonisable organic impurities may be detected by the behaviour of the salt when treated with concentrated Sulphuric Acid, a pure specimen should not become more than faintly coloured; Quinine or Quinidine Sulphates may be detected by the marked fluorescence produced in a 1 in 1000 solution of the salt by diluted Sulphuric Acid, not more than a faint blue fluorescence should be noticed; Cinchonine Sulphate may be detected by precipitating the Cinchonidine as an insoluble Tartrate and testing the filtrate with a drop of Ammonia Solution. A weighed quantity of 0·5 gramme is macerated at 15° C. (59° F.), with 20 c.c. of Water; 0·5 gramme of Potassium Sodium Tartrate is added and the maceration continued with intervals of repeated agitation for 1 hour, the temperature being maintained at 15° C. (59° F.). A drop of Ammonia Solution added to the filtered liquid should not produce more than a slight turbidity. This test also serves to detect Quinidine Sulphate. Mineral matter may be detected by the residue left on ignition; the salt should leave no weighable residue when ignited with free access of air.

CINCHONINÆ IODO-SULPHAS (Antiseptol).—A brown, or reddish-brown, odourless powder, insoluble in Water, soluble in Alcohol (90 p.c.), and in Chloroform. It contains about 50 p.c. of Iodine. Introduced as a substitute for Iodoform. Used in the form of a 1 in 8 ointment for lupus. Has also been given internally in doses of 1 to 5 grains = 0·06 to 0·32 gramme.

CINCHONINÆ SULPHAS $(C_{19}H_{22}N_2O)_2, H_2SO_4, 2H_2O$, eq. 717·20.—Hard, white, shining, odourless, prismatic crystals, having a very bitter taste.

It is the Sulphate of an alkaloid obtained from various species of Cinchona Bark. *B.P.* 1885 said from Cinchona and Remijia Bark. It contains theoretically 81·44 p.c. of Cinchonine and 4·98 p.c. of Water.

Solubility.—1 in 70 of Water, 1 in 9 of Alcohol (90 p.c.), 1 in 60 of Chloroform, sparingly in Ether.

Dose.—1 to 10 grains = 0·06 to 0·65 gramme.

Foreign Pharmacopœias.—Official in Mex., Port. and U.S. Not in the others.

Tests.—Cinchonine Sulphate when heated to 100° C. (212° F.) readily loses its Water of crystallisation, and when rendered anhydrous at this temperature it melts at about 198·5° C. (389·5° F.). Its aqueous solution is neutral in reaction towards Litmus paper, and is dextrorotatory, and yields on the addition of Ammonia Solution a white precipitate. The aqueous solution when acidified with diluted Sulphuric Acid and Chlorine Water added yields no green coloration on the addition of an excess of Ammonia Solution. The addition of Barium Chloride solution to an aqueous solution of the salt yields a white precipitate insoluble in Hydrochloric Acid. One part of the powdered anhydrous Sulphate should dissolve in 80 parts by weight of Chloroform.

The more generally occurring impurities are excess of moisture, Quinine or Quinidine Sulphates, Cinchonidine Sulphate, readily carbonisable organic impurities and mineral matter. Excess of moisture is readily shown by the loss in weight of 1 gramme of the salt at 100° C. (212° F.) which should not amount to more than 5·0 p.c., the theoretical percentage as above indicated being 4·98 p.c.; Quinine and Quinidine Sulphates produce a marked blue fluorescence in a 1 in 1000 solution of the salt in diluted Sulphuric Acid. Cinchonidine Sulphate is detected, and additional confirmation of the presence of Quinine Sulphate is afforded when 1 part of the anhydrous salt is treated with 80 parts by weight of Chloroform, anhydrous Cinchonine Sulphate will dissolve, anhydrous Quinine and Cinchonidine Sulphates are insoluble in Chloroform; readily carbonisable organic impurities may be detected by concentrated Sulphuric Acid, the salt should not yield more than a pale yellow coloration, mineral matter may be detected by the residue left on ignition, the pure salt leaving no residue on incineration.

Cinchonidinæ Sulphas Acidus and **Cinchoninæ Sulphas Acidus** are also known. These salts are more readily soluble in Water.

Cinchonidinæ Salicylas and **Sulphocarbolas** have been used, the former as a tonic and antiperiodic, the latter as an antiseptic, and as a prophylactic against malaria.

ACIDUM CHINICUM. Chinic Acid, Kinic Acid, Quinic Acid, $C_7H_{12}O_6$, eq. 190·65.—Colourless, transparent, rhombic prisms or flat, crystalline masses, having a strongly acid but not a bitter taste.

Solubility.—1 in 2½ of Water, 1 in 42 of Alcohol (90 p.c.); insoluble in Ether.

Tests.—Quinic Acid possesses a melting point of 161° to 162° C. 321·8° to 323·6° F.). Its aqueous solution is lævogyrate. A little of the powder distilled with Manganese Dioxide and Sulphuric Acid yields Quinone, which condenses on the cool side of the tube in the form of deep yellow prisms. The acid may be titrated with Normal Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator, a weighed quantity of 1 gramme of the acid should require about 5·2 c.c. of the Volumetric Solution corresponding to about 99 p.c. of pure Chinic Acid. It should leave no residue when ignited with free access of air.

It has been introduced in the treatment of the Uric Acid diathesis and in gout. It is more generally employed in the form of a salt, *e.g.*, Lithium Quinate, *q.v.* p. 738.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

CINNAMOMI CORTEX.

CINNAMON BARK.

FR., CANNELLE DE CEYLAN; GER., CHINESISCHER ZIMMT (CASSIA); ITAL., CANNELLA DEL CEYLAN; SPAN., CANELA DE CEYLAN.

The dried inner Bark of shoots from the truncated stocks of *Cinnamomum Zeylanicum.* The bark from cultivated trees is alone official. Imported from Ceylon, and commercially known as Ceylon Cinnamon.

Medicinal Properties.—Carminative, astringent, aromatic stimulant, and antiseptic, chiefly used as an adjuvant to other medicines, and as a flavouring agent. Often employed with Chalk in diarrhœa. An essence has been used as a prophylactic against influenza.

60-grain doses for dysentery.—*B.M.J.* '95, i. 530; *L.* '95, i. 567. Has been lauded for cancer, but the majority of evidence is not in its favour.—*M.A.* '95, 163.

Inhalation of **Oil of Cinnamon** in the treatment of consumption.—*B.M.J.* '96, ii. 1374.

The vapour of the Oil of Cinnamon exerted no retarding or inhibitive influence on the growth of the tubercle bacillus.—*B.M.J.* '99, i. 203.

Dose.—10 to 20 grains = 0·65 to 1·3 gramme in powder.

Official Preparations.—Of the **Bark,** Aqua Cinnamomi, Oleum Cinnamomi, Pulvis Cinnamomi Compositus, and Tinctura Cinnamomi; used in the preparation of Decoctum Hæmatoxyli, Pulvis Catechu Compositus, Pulvis Cretæ Aromaticus, Pulvis Kino Compositus, Tinctura Cardamomi Composita, Tinctura Catechu, and Tinctura Lavandulæ Composita. Of the **Water,** Mistura Cretæ, Mistura Guaiaci, Mistura Olei Ricini, Mistura Spiritus Vini Gallici, Syrupus Aromaticus and Syrupus Cascaræ Aromaticus. Of the **Oil,** Spiritus Cinnamomi. Of the **Compound Powder,** Pilula Aloes et Ferri and Pilula Cambogiæ Composita. Of the **Spirit,** Acidum Sulphuricum Aromaticum.

Not Official.—Pulvis Aromaticus, Tinctura Cinnamomi Composita, Tinctura Aromatica.

Foreign Pharmacopœias.—Official in Austr., Dan., Dutch, Fr. (Cannelle), Ital. (Cannella), Mex. (Canela), Norw., Port. (Canella), and Swed. use Ceylon Cinnamon only. Ger., Hung., Jap. and Russ. use Chinese Cinnamon or Cassia only. Belg., Span., Swiss and U.S. use both kinds.

Descriptive Notes.—By the name of Cinnamon in this country the bark of *Cinnamomum Zeylanicum*, Breyn., imported from Ceylon, is understood. In Germany the Cortex Cinnamomi, official in the *P.G.*, is the bark known as Cassia in this country, but as Chinese

Cinnamon in Germany and in the United States. In the *U.S.P.* the Ceylon Cinnamon is official as *Cinnamomum Zeylanicum*, but instead of Cassia or Chinese Cinnamon there is also official a kind known as Saigon Cinnamon, which is the bark of an undetermined species of *Cinnamomum.* Of the Cinnamon tree about six varieties are cultivated in Ceylon, and the different grades are distinguished by being packed in rolls of quills of different sizes, the more slender the rolls the better the quality, therefore the limit of size given in the *B.P.* ⅜ inch (9 mm.) in diameter indicates the quality intended. The scrapings of the tips of the shoots and the broken fragments of quills have been regularly imported into Europe since 1867 under the name of 'Cinnamon chips' and have been used for the distillation of the oil. The thick trunk bark is sometimes offered in commerce, but has very little aroma, and probably finds its way into the cheaper kinds of mixed spice. Cassia bark in powder is sometimes substituted for that of Cinnamon, but it may be detected by the different flavour, and under the microscope by the presence of cork cells, which are absent from Cinnamon, by the larger and broader bast fibres, and the larger starch grains. Cassia bark is known to drug brokers under the name of 'Cassia lignea' to distinguish it from 'Cassia vera,' which is a hard mucilaginous bark derived from *Cinnamomum Burmanni*, DC., with an allied but different odour, and apparently imported from Padang in Sumatra. Chinese Cassia occurs in small quills 2 to 3 inches (5 to 7·5 cm.) long made into packets of about 12 inches (30 cm.) long and 3 inches (7·5 cm.) in diameter; Cassia vera in quills 12 to 15 inches (30 to 37·5 cm.) or more in length; Saigon Cassia, which goes chiefly to the United States, occurs in quills 3 to 4 inches (7·5 to 10 cm.) long, and has a more intensely sweet taste and stronger flavour. The *P.G.* directs that Cassia should not have a mucilaginous taste and that the medullary rays are usually only 2 cells thick, thus excluding the Padang Cassia vera. Other species of Cassia imported into this country may be distinguished under the microscope even if used in powdered form, *see Museum Report, Pharm. Soc.* 1903, pp. 50, 51. Some commercial samples of powdered Cinnamon apparently contain a large proportion of Cinnamon bark that has been distilled.

Tests.—Cinnamon Bark leaves on incineration about 4 p.c. of ash, and 6 p.c. is seldom exceeded. Eight samples examined in the author's laboratory gave from 2·8 to 4·26 p.c., with an average of 3·5 p.c.; 6 samples of the powder gave from 4·32 to 5·2 p.c., with an average of 4·74 p.c. The *U.S.P.* gives not over 4 p.c. No limit of ash is given in the *B.P.*

Preparations.

AQUA CINNAMOMI. Cinnamon Water.

Cinnamon Bark, bruised, 1; Water, 20; distil 10. (1 in 10)

The distilled 'Aqua' is very turbid from suspended Oil. There is no recognised rule in dispensing as to whether it should be filtered or not, but it is customary to do so.

Dose.—1 to 2 fl. oz. = 28·4 to 56·8 c.c.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Ger., Jap., Russ., Swed. and Swiss, 1 in 10; Fr. (Eau de Cannelle), 1 in 5; Ital. (Acqua dist. di Cannella), Mex. (Agua destilada de Canela), 1 in 4; Hung., 1 in 5; also Aqua Cinnamomi Spirituosa, 3 in 10; Port., 1 in 8; Span. (Agua destilada de Canela) C. 270, Water 2000, Alcohol (90 p.c.) 100, distil 1200. Norw. and U.S., made with Oil 1 in 500.

Tests.—An approximate idea of the amount of oxidation of the Cinnamic Aldehyde which has occurred may be obtained by acidifying a measured quantity with 25 p.c. Sulphuric Acid Solution and adding Deci-normal Volumetric Potassium Permanganate Solution till the fluid acquires a pink coloration, remaining permanent for several seconds. The amount of Cinnamic Acid may be determined by titration with Deci-normal Volumetric Sodium Hydroxide Solution. 10 c.c. of a freshly Distilled Water will require from 12 to 14 c.c. of the Deci-normal Volumetric Potassium Permanganate Solution, and about 0·1 c.c. of the Deci-normal Volumetric Sodium Hydroxide Solution; a Water which has been distilled and stocked for some time may require only 4 c.c. of the Permanganate Solution and about 1·5 c.c. of the Deci-normal Volumetric Sodium Hydroxide Solution.

OLEUM CINNAMOMI. OIL OF CINNAMON.

FR., ESSENCE DE CANNELLE DE CEYLAN; GER., ZIMMTOL (CASSIA); ITAL., ESSENZA DI CANNELLA; SPAN., ESENCIA DE CANELA.

A light yellow liquid, obtained by distillation from Cinnamon Bark, and possessing the agreeable, delicate, aromatic odour of the Ceylon Cinnamon, and a spicy, sweet, burning taste. It darkens in colour by exposure to light and air. It should be kept in dark amber-tinted, well-closed glass bottles, and protected as far as possible from the air and light.

It usually contains 65 to 75 p.c. of Cinnamic Aldehyde, from 4 to 8 p.c. of Eugenol, and some Phellandrene. Yield of oil is about 0·5 to 1 p.c.

Cinnamic Acid, an oxidised product of the oil, is described under Acidum Cinnamicum, p. 39.

Solubility.—10 in 3 of Alcohol (90 p.c.); 1 in 45 of Alcohol (60 p.c.).

Medicinal Properties.—Possesses the aromatic and antiseptic properties of Cinnamon Bark, without its astringency. It is a powerful local stimulant when administered internally.

Of late years the medicinal virtues of Cinnamon have received a good deal of attention. The Oil has already been used as an inhalation in phthisis. It has been shown in the Bradshaw Lecture on the treatment of enteric fever (*B.M.J.* '04, ii. 1451; '05, i. 414) that 2½-minim doses given at the commencement, followed by increasing doses up to 5 minims, have given favourable results. An appreciable, though slight, inhibitory influence on the growth of typhoid bacillus begins to be exerted by the oil in a dilution of about 1 in 2600, and when the strength approaches 1 in 1000 its antiseptic effect is complete. The quality of the drug must be above reproach.

Dose.—½ to 3 minims = 0·03 to 0·18 c.c.

In pill or on Sugar.

Foreign Pharmacopœias.—Official in Dutch, Fr., Ital., Mex. (Aceite Volatil de Canela), Port. and Span. use Oil of Cinnamon; Dan., Ger., Hung., Jap., Norw., Swiss and U.S. use Oil of Cassia. Austr. and Swed., Cinnamalum (Cinnamic Aldehyde) in place of Oil of Cassia; U.S., Cinnaldehydum as well as Oil of Cassia; Belg., Oils of Cinnamon and of Cassia.

Tests.—Cinnamon Oil should possess a specific gravity of from 1·023 to 1·040, the official figures are from 1·025 to 1·038. Optically it is almost inactive, the rotation not varying more than 1° in a tube of 100 mm. It should dissolve to form a clear solution in 2 parts by weight of Alcohol (70 p.c.). It is officially required to show the absence of more than 50 p.c. of non-aldehydic constituents as determined by well shaking a measured quantity of 10 c.c. with 5 times its volume of a boiling Sodium Hydrogen Sulphite Solution (30 p.c.), the oily layer which separates being required to measure when cooled to 15·5° C. (60° F.), not more than 5 c.c. The official test is unsatisfactory, and the directions quite inadequate. The Sodium Hydrogen Sulphite Solution should be added in small portions at a time, and care should be taken to heat after each addition until the solid compound liquefies. The oil official in the *B.P.* is that derived from Ceylon Cinnamon, that of the *U.S.P.* and *P.G.* from Cassia Cinnamon. The *B.P.* oil should contain not more than 50 p.c. of non-aldehydic constituents; the *U.S.P.* not less than 75 p.c., and the *P.G.* not less than 70 p.c. of Cinnamic Aldehyde. A determination of the percentage of Cinnamic Aldehyde present in a specimen may be made by the process given under the tests for Oil of Cassia.

The chief adulterant of Cinnamon Oil is oil distilled from Cinnamon leaf. It may be qualitatively detected by dissolving a measured quantity of the oil in 5 times its volume of Alcohol (90 p.c.), and adding a few drops of Ferric Chloride Test-solution, no decided blue coloration should be produced. If present in quantity it would cause an increase in the specific gravity, the percentage of Cinnamic Aldehyde would be lowered, and the Eugenol content increased. The percentage of Eugenol may be determined approximately by treating the oil with a 5 p.c. Potassium Hydroxide solution and measuring the diminution in volume. If more accurate results are desired, the Eugenol may be determined by conversion into Benzoyl-eugenol as described in the tests under Oleum Caryophylli.

The tests of the *U.S.P.* and *P.G.* are compared under Oil of Cassia.

PULVIS CINNAMOMI COMPOSITUS. COMPOUND POWDER OF CINNAMON. *B.P.Syn.*—PULVIS AROMATICUS.

Cinnamon Bark, 1; Cardamom Seeds, 1; Ginger, 1, all in powder. (1 in 3)

Dose.—10 to 40 grains = 0·65 to 2·6 grammes.

Foreign Pharmacopœias.—Official in Port (Pó de Canella Comp.), Cinnamon 7, Cardamoms 7, Ginger 6; Pulvis Aromaticus, Dutch same as Brit.; Swiss, Cinnamon 1, Cardamoms 1, Ginger 1, Sugar 7; U.S., Cinnamon 7, Ginger 7, Cardamoms 3, Nutmeg 3. Not in the others.

SPIRITUS CINNAMOMI. Spirit of Cinnamon.

Oil of Cinnamon, 1; Alcohol (90 p.c.), *q.s.* to yield 10.

B.P. 1885 was 1 in 50.

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

Foreign Pharmacopœias.—Official in Belg., 1 in 100; Jap., Cassia Oil 1 in 50; U.S., 1 in 10; Dutch, Ital., Mex. and Port. (distilled from the Bark). Not in the others.

Tests.—Spirit of Cinnamon has a specific gravity of from 0·850 to 0·855; it leaves about 0·24 p.c. w/v of residue on evaporation over a water-bath; this residue, when dissolved in Alcohol (90 p.c.) yields a green coloration on the addition of Ferric Chloride Test-solution.

TINCTURA CINNAMOMI. Tincture of Cinnamon.

1 of Cinnamon Bark, in No. 40 powder, percolated with Alcohol (70 p.c.), to yield 5.

B.P. 1885 was 1 in 8, with Rectified Spirit.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S., 1 in 5; all by weight except U.S.

Tests.—Tincture of Cinnamon has a specific gravity of from 0·898 to 0·906; contains from 1·8 to 3·0 p.c. w/v of total solids and from 65 to 69 p.c. w/v of Absolute Alcohol.

Not Official.

PULVIS AROMATICUS (*B.P.* 1864).—Cinnamon 4; Nutmeg 3; Saffron 3; Cloves 1½; Cardamoms 1; Refined Sugar 25.

This has been incorporated in the *B.P.C.* as follows:—

Pulvis Aromaticus Compositus.—Cinnamon Bark 10·66; Nutmeg 8; Saffron 8; Cloves 4; Cardamom Seeds 2·66; Refined Sugar 66·66.

TINCTURA CINNAMOMI COMPOSITA (*P.L.*).—Cinnamon, 1 oz.; Cardamoms, ½ oz.; Long Pepper, 2½ drm.; Ginger, 2½ drm.; Proof Spirit, 40 fl. oz.

This has been incorporated in the *B.P.C.* as follows:—Cinnamon Bark, bruised, 2·50; Cardamom Seeds, bruised, 1·25; Long Pepper, bruised, 1; Ginger, bruised, 1; Alcohol (60 p.c.), sufficient to produce 100.

Port. (Tinctura di Canella Composta), Cinnamon 10, Cardamoms 4, Cloves 4, Ginger 2, Alcohol (85 p.c.) 100.

TINCTURA AROMATICA (*Ger.*, *Russ.* and *Swiss*).—Cinnamon Root, in coarse powder, 5; Ginger, 2; Galangal Root, 1; Cloves, 1; Cardamoms, 1; Diluted Alcohol, 50.

Ger. use 60 p.c., *Russ.* 70 p.c., and *Swiss* 68 to 69 p.c. Alcohol.

Austr., same form but with Zedoary Root in place of Galangal Root.

Dan. and *Norw.*, Cinnamon, 4; Ginger, Galangal Root, Cloves and Cardamoms, of each 1; Alcohol (68 p.c.), 40.

Jap., Cloves 2, Cinnamon 10, Cardamoms 2, Ginger 5, Alcohol (68 p.c.) 100, extract in the cold for 7 days; press; filter; to the filtrate add Spirit of Lemon 5.

COCÆ FOLIA.

COCA LEAVES.

Fr., Feuille de Coca; Ger., Cocablatter; Ital., Foglia di Coca; Span., Coca del Peru (Hojade).

The dried leaves of *Erythroxylum Coca*, and its varieties.

Coca leaves contain an amount of alkaloids varying from 0 to 1·5 p.c. The average amount is about 0·5 p.c. The leaves frequently contain very little alkaloid, owing to the alkaloids readily undergoing decomposition when the leaves are exposed to heat and moisture. The amount of Cocaine in a good sample of leaves is about 70 p.c. or even less of the total alkaloids. The leaves official in the *U.S.P.* are required to yield not less than 0·5 p.c. of the Ether-soluble alkaloids of Coca; those official in the new *Swiss Ph.* a minimum content of 0·7 p.c. of alkaloids.

Medicinal Properties.—A nervine and muscular tonic, stimulant and restorative. Useful during convalescence, in debility and nervous exhaustion, and to prevent fatigue. The leaves are chewed by the natives of Peru and Bolivia to sustain them during the day, that they may defer eating till the evening.

It has been recommended for the cure of the craving for Opium and for Alcohol, but the craving for Cocaine, which is acquired by the excessive use of Coca, is possibly worse than either.

Official Preparations.—Extractum Cocæ Liquidum. Used in the preparation of Cocaina and Cocainæ Hydrochloridum.

Not Official.—Elixir Cocæ, Extractum Cocæ, Tinctura Cocæ, and Vinum Cocæ.

Foreign Pharmacopœias.—Fr., Ital., Jap., Port. and U.S. (Coca); Mex. and Span. (Coca del Peru); Swiss (Folium Cocæ). Not in the others.

Descriptive Notes.—The Coca leaves of commerce are of three varieties. The Bolivian or Huanuco, the Peruvian or Truxillo, and the Coca leaves cultivated in Java. The first are derived from *Erythroxylon Coca*, Lamarck., and the second from a plant which has been named by Rusby, *Erythroxylon Truxillense.* The third is described by botanists as derived from *E. Spruceanum*, Burck. The Bolivian leaves are oval, dark olive green when fresh, with a dark mid-rib, and are usually not broken. The Peruvian are thinner, pale green, oblanceolate and narrower, and are generally much broken. The Java leaves are more lanceolate, darker green, and the mid-rib is reddish towards the base. The leaves as they arrive in commerce vary in size and quality. In the *B.P.* the size of the Bolivian is defined as 1½ to 3 inches (37 to 75 mm.) long and 1 to 1½ inches (25 to 37 mm.) in breadth, and oval; but the Peruvian leaves are only described as smaller, narrower, and more brittle than the Bolivian. They are, however, different in shape, being more or less oblanceolate and more tapering towards the base. The Java leaves are not described in the *B.P.* In the Bolivian Coca the mid-rib has a prominent ridge on its upper surface which is not present in the Peruvian. The lateral lines, formed of collenchyma, where the leaf is folded when young, are more prominent in the Bolivian than in the other varieties. Under the microscope the characteristic features are the papillose polygonal cells of the under surface, the papillæ presenting the appearance of a circle in the centre of each cell, the pericyclic fibres, the prismatic crystals, and the stomata between two narrow cells parallel with the guard cells. Coca leaves for use in pharmacy should not smell or taste mouldy, and should produce a slightly numbing effect on the tongue. They lose alkaloids if exposed to damp, or if not carefully dried.

Tests.—Coca Leaves of the *B.P.* are not required to yield any definite percentage of alkaloids, and no method of determination is given. The *U.S.P.* method is carried out on the following lines:—A weighed quantity of 10 grammes of the leaves in No. 60 powder is transferred to an Erlenmeyer flask and allowed to soak for 10 minutes in 50 c.c. of a mixture of 1 part by volume of Chloroform and 4 parts by volume of Ether. After the addition of a mixture of 2 c.c. of Ammonia Solution and 3 c.c. of Water, the flask is set aside for one hour, with intervals of frequent shaking. The contents of the flask are then transferred to a small percolator having a Cotton-Wool plug packed in the neck and connected with a separator containing a mixture of 6 c.c. of Normal Volumetric Sulphuric Acid Solution and 20 c.c. of Water. The leaves are packed into the percolator with a glass rod after the liquid has passed through; the flask is washed with 10 c.c. of the Chloroform-Ether mixture and the residue in the flask transferred to the percolator with several successive portions of 5 c.c. of the Chloroform-Ether mixture, and percolation continued with this menstruum, using in all 50 c.c. The alkaloids are now removed from the Chloroform-Ether solution by shaking the separator vigorously, and the acid layer removed after complete separation. The Chloroform-Ether is shaken a second and a third time with 10 c.c. of a similar mixture of Sulphuric Acid and Water, the mixed acid liquids are transferred to a second separator, rendered distinctly alkaline with Ammonia Solution, and the liberated alkaloids shaken out first with 25 c.c., then with 20 c.c., and finally with 15 c.c. of Ether. The mixed ethereal solutions are evaporated on a water-bath at a gentle heat, the residue dissolved in 3 c.c. of Ether and the Ether again evaporated. The residue is dissolved in 4 c.c. of Decinormal Volumetric Sulphuric Acid Solution, and the excess of acid is titrated with Fiftieth-normal Volumetric Potassium Hydroxide Solution, using 5 drops of Cochineal or Iodeosin Test Solution as an indicator of neutrality. If the number of c.c. of Fiftieth-normal Solution required be divided by 5, the quotient subtracted from 4, and the remainder multiplied first by 0·03 and then by 10, the product will represent the p.c. of Ether-soluble alkaloids present in the leaves.

The ash of Coca Leaves amounts to from 6 to 8 p.c.

Preparation.

EXTRACTUM COCÆ LIQUIDUM. Liquid Extract of Coca. Percolate 20 of Coca Leaves in powder with Alcohol (60 p.c.)

until the drug is exhausted. Reserve the first 15 of percolate and evaporate remainder at a temperature below 80° C. (176° F.) to a soft extract, which dissolve in the reserved portion, and add Alcohol (60 p.c.), *q.s.* to yield 20. (1 in 1)

Note.—As the Coca Leaves would be but imperfectly exhausted by the first 15 parts of the Alcohol, and as the active constituents are damaged or destroyed by heat, a fluid extract prepared by repercolation is much to be preferred. When thus prepared from carefully dried green leaves it contains 25 p.c. of solid Extract (dried at 212° F.).

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Fr., Mex., Swiss and U.S. Not in the others.

A dark green fluid extract prepared from Coca leaves. The *B.P.* product is not standardised; the *U.S.P.* preparation is required to contain 0·5 p.c. w/v of the Ether-soluble alkaloids of Coca; the *P.G.* does not contain a Fluid Extract.

Tests.—Fluid Extract of Coca possesses a specific gravity of 0·990 to 1·030, yields about 19·0 p.c. w/v of total solids, and contains about 50 p.c. w/v of Absolute Alcohol. The *B.P.* does not include a process for the determination of the alkaloids; the *U.S.P.* gives a method of determining the Ether-soluble alkaloids, the essential features of which are as follows:—A measured quantity of 10 c.c. of the fluid is introduced into a separator, rendered alkaline by the addition of 2 c.c. of Ammonia Solution, and the alkaloids extracted by shaking for 1 minute with 25 c.c. of Ether. The separated aqueous liquid is shaken with a further quantity of 20 c.c. of Ether, the aqueous portion separated, the mixed ethereal solutions are shaken well for 1 minute with a mixture of 5 c.c. of Normal Volumetric Sulphuric Acid Solution and 5 c.c. of Distilled Water, the extraction being repeated with a mixture of 1 c.c. of Normal Volumetric Sulphuric Acid Solution and 9 c.c. of Water, the acid liquids in each case being separated and transferred to a second separator. Sufficient Ammonia Solution is now added to render the liquid distinctly alkaline, and the liberated alkaloids are shaken out with 20 c.c. of Ether, the extraction being completed with two further quantities each of 15 c.c. of Ether. The separated ethereal solutions are mixed, transferred to a tared flask, the Ether evaporated and the residue dried. It is then dissolved in 5 c.c. of Deci-normal Volumetric Sulphuric Acid Solution, and the excess of acid is titrated with Fiftieth-normal Volumetric Potassium Hydroxide Solution, using Cochineal or Iodeosin Test Solution as an indicator of neutrality. If the number of c.c. of Fiftieth-normal Solution required be divided by 5, the quotient subtracted from 5, the difference multiplied first by 0·03 and then by 10, the product will represent the percentage w/v of the Ether-soluble alkaloids of Coca present in the sample. The average results of the examination by a special process, given in the reference, of 7 samples of Liquid Extract prepared by the official process and 7 'miscible' Liquid Extracts is recorded *C.D.* '02, i. 421. The average yield of the 'official' samples was 0·38 p.c., and they varied from 0·20 p.c. w/v to 0·816 p.c. w/v; the 'miscible' 0·091 p.c. of alkaloid, and they varied from 0·014 to 0·294 p.c. w/v. A specimen of commercial 'miscible' Liquid Extract examined in the author's laboratory by the *U.S.P.* process showed 0·465 p.c. of alkaloids.

Not Official.

EXTRACTUM COCÆ.—A solid alcoholic green extract, prepared from carefully dried leaves.

Dose.—2 to 10 grains = 0·13 to 0·65 gramme, in pills, pastils, or lozenges.

Foreign Pharmacopœias.—Official in Fr. Codex, Ital. and Span. Not in the others.

ELIXIR COCÆ.—Coca Leaves, 1; Simple Elixir, 6.—*Martindale.*

Miscible Liquid Extract of Coca, 16·5; Simple Elixir to make 100.—*B.P.C.*

The Miscible Liquid Extract of Coca is 100 of *B.P.* Liquid Extract evaporated to 50, decanted from the deposit, which is washed with 10 of Water, the washings mixed with the concentrated fluid, and finally made up with Alcohol (60 p.c.) to 100.

TINCTURA COCÆ.—Coca Leaves, 1; Alcohol (60 p.c.), 5.—*Fr.* and *Ital*

Swiss, the same quantities, but with Alcohol (68 to 69 p.c.). All by weight.

This has been incorporated in the *B.P.C.* with Alcohol (60 p.c.) by measure.

VINUM COCÆ. *Syn.* VIN DE COCA (*Fr.*).—Dried Leaves of Coca, 6; Vin de Malaga, 100; macerate for 10 days, and filter.

Wine of Coca can also be made by adding an equivalent quantity of the Liquid Extract to Wine.

Coca Wine, if sufficiently weak to be used as a beverage, requires a wine licence. The Excise has drawn the line at Wines containing ½ grain of alkaloid to the oz., which would be at least twice as strong as the above.

Foreign Pharmacopœias.—Official in Fr., 6 in 100; Mex., 3 in 100; Span., 1 in 33½; Swiss, 1 of Fluid Extract in 20. U.S. about 1 in 15. Not in the others.

Elixir of Coca, 1; Detannated Sherry, to make 8.—*B.P.C.*

COCAINA.

COCAINE.

METHYL-BENZOYL-ECGONINE.

$C_{17}H_{21}NO_4$, eq. 300·93.

Large, colourless, odourless, monoclinic prisms, having a bitter taste, followed by anæsthesia of the mucous membrane. It is an alkaloid obtained from the leaves of *Erythroxylum Coca*, and its varieties.

Solubility.—About 1 in 1300 of Water (Paul); 1 in 10 of Alcohol (90 p.c.); 1 in 50 of Olive Oil; 1 in 4 of Oleic Acid; 2 in 1 of Chloroform; 1 in 4 of Ether; 1 in 14 of Oil of Turpentine. Insoluble in Glycerin.

These figures have been incorporated in the *B.P.C.*

Official Preparation.—Unguentum Cocainæ.

Not Official.—Guttæ Cocainæ Oleosæ, Nebula Cocainæ Composita, Nebula Cocainæ Oleosa, Oleatum Cocainæ, Unguentum Cocainæ, Unguentum Suprarenalin et Cocainæ.

Foreign Pharmacopœias.—Official in Fr., Mex., Span. and U.S. Not in the others.

Tests.—The distinguishing tests for Cocaine are the melting point, which should be 98° C. (208·4° F.)—*B.P.* says 96° to 98° C. (204·8° to 208·4° F.), *U.S.P.* 98° C. (208·4° F.), *Fr. Codex* (1908) 98° C. (208·4° F.)—the lævorotatory nature of its solutions, the alkaline reaction of its aqueous solution towards Litmus and Methyl Orange Solutions, the marked anæsthesia which it produces on the mucous membrane, and its mydriatic effect on the pupil of the eye. When exactly neutralised with Hydrochloric Acid the solution yields with Potassium Permanganate Solution a purple-violet precipitate, possessing a very characteristic microscopic appearance. This crystallisation takes place best in a solution of about 5 p.c. strength. When a crystal is moistened with one or two drops of fuming Nitric Acid, evaporated to dryness on a water-bath, and the residue moistened with a few drops of an alcoholic Potassium Hydroxide Solution, a peculiar characteristic fruity odour is produced. This test is characteristic of Cocaine, no other alkaloid extracted by Benzene from an ammoniacal solution behaving at all similarly. The salts of Cocaine are neutral to most indicators of neutrality, and the pure alkaloid may therefore be readily determined by titration with Normal or Deci-normal Volumetric Hydrochloric Acid Solution, 1 c.c. of Normal Acid representing 0·30093 gramme of the pure alkaloid. Iodeosin or Cochineal Solution is the most suitable indicator for the purpose.

The impurities likely to be present in the alkaloid are also those more generally examined for in the Hydrochloride, and the methods by which they may be detected will be found under Cocaine Hydrochloride. Cocaine readily undergoes hydrolysis, and aqueous solutions are decomposed even on boiling; the decomposition being greatly facilitated by the presence of acid. The *B.P.* states, 'its solution in water acidulated with Hydrochloric Acid and the dry salt obtained on evaporating this solution afford the reactions mentioned under Cocaine Hydrochloride'; the *B.P.C.* has construed this expression into 'when its solution in Hydrochloric Acid is evaporated to dryness, the residue should respond to the tests given under Cocaine Hydrochloride'; the *U.S.P.*, evidently with a view to minimising the amount of decomposition taking place, requires that if an alcoholic solution of Cocaine be carefully neutralised with Hydrochloric Acid and the solution evaporated to dryness, the residue should respond to the reactions and tests given under the Hydrochloride.

A solution of the alkaloid in water acidified with Nitric Acid should yield no opalescence or precipitate with either Silver Nitrate or Barium Chloride Solution. The alkaloid should yield no weighable residue on ignition. Only the Hydrochloride is official in the *P.G.*

Preparation.

UNGUENTUM COCAINÆ. COCAINE OINTMENT.

Dissolve 1 of Cocaine in 4 (by weight) of Oleic Acid at a gentle heat, and mix with 20 of Lard. (1 in 25)

Oleatum Cocainæ.—Cocaine, 5; Alcohol, 5; Oleic Acid, 50; Olive Oil, *q.s.* to produce 100.—*U.S.*

Guttæ Cocainæ Oleosæ.—Cocaine, 8 grains; Castor Oil, 1 oz.—*St. George's.*

Not Official.

NEBULA COCAINÆ COMPOSITA.—Cocaine, 2 grains; Menthol, 4 grains; Eucalyptus Oil, 6 minims; Camphor, 4 grains; Spray Oil, 1 fl. oz.—*Bournemouth Formulary.*

Nebula Eucalypti et Mentholis et Cocainæ, *B.P.C.*, closely resembles the above:—Cocaine, 0·5; Menthol, 1; Oil of Eucalyptus, 1·25; Camphor, 1; Liquid Paraffin, to produce 100.

A modification of the above appears in the *B.P.C. Supplement* as follows:—**Nebula Cocainæ Composita.**—Compound cocaine spray is prepared by dissolving 0·415 of Cocaine in sufficient compound Menthol and Thymol spray to produce 100.

NEBULA COCAINÆ OLEOSA.—Cocaine, 25 grains; Oil of Sweet Almonds, 1 fl. oz. Dissolve by heat.—*Central Throat.*

UNGUENTUM COCAINÆ.—Cocaine, 2 grains; Soft Paraffin, 100 grains. —*London Ophthalmic.*

The title for this in *St. Thomas's* and *B.P.C.* is **Unguentum Cocainæ Dilutum** (pro oculis). The Cocaine should be finely powdered and rubbed with a small quantity of the Soft Paraffin, the remainder added, and dissolved with the aid of a gentle heat.

Unguentum Cocainæ (Ophthalmic).—Cocaine Hydrochloride, 8 grains; Soft Paraffin, to 1 oz.—*London.*

UNGUENTUM ATROPINÆ ET COCAINÆ.—*See* Atropine.

UNGUENTUM SUPRARENALIN ET COCAINÆ.—Suprarenalin, ½ grain; Boric Acid, 1 grain; Cocaine Hydrochloride, 5 grains; Distilled Water, 15 minims; Hydrous Lanoline, 250 grains; Vaseline, 250 grains.—*Bournemouth Formulary.*

This has been incorporated in the *B.P.C.* under the title **Unguentum Adreninæ et Cocainæ,** employing Adrenine.

COCAINÆ HYDROCHLORIDUM.

COCAINE HYDROCHLORIDE.

HYDROCHLORATE OF COCAINE.—*B.P.* '85.

$C_{17}H_{21}NO_4HCl$, eq. 337·12.

FR. CHLORHYDRATE DE COCAÏNE; GER., COCAINHYDROCHLORID; ITAL., CLORIDRATO DI COCAINA; SPAN., CLORURO DE COCAINA.

Colourless, odourless, transparent, prismatic crystals, or acicular crystals, or a white glistening crystalline powder. Taste slightly bitter, producing upon the tongue a tingling sensation followed by numbness of some minutes' duration.

Solubility.—2 in 1 of Water; 1 in 2½ of Alcohol (90 p.c.); 1 in 2½ of Glycerin; about 1 in 20 of Chloroform; almost insoluble in Ether; insoluble in fixed Oils.

Medicinal Properties.—Local anæsthetic, mydriatic. Has been largely used for producing local anæsthesia in examinations of and operations on the eye and throat; and in dentistry (¼ to ½ grain being injected into the gum); 2 p.c. solutions being used for the eye and 20 p.c. for the throat. It is used locally in producing anæsthesia of other mucous membranes, as the urethra, vagina, nose and rectum; in the form of spray containing $\frac{1}{2}$ to 2 p.c., with or without other medicaments such as Adrenalin 1 in 5000, in aqueous solution; or $\frac{1}{2}$ p.c. of Cocaine with 1 p.c. of Menthol in Liquid Paraffin (*see* also p. 772); in the form of Bougies, Pessaries, or Suppositories containing $\frac{1}{2}$ grain of the salt in each with Oil of Theobroma. Anæsthesia of the deeper seated tissues for minor operations is produced by local infiltration of Cocaine, combined generally, with Adrenalin. Injected locally for sciatica and for neuralgia. It has been used successfully as a preventive of sea-sickness, in doses of $\frac{1}{4}$ to 1 grain in solution, and in doses of $\frac{1}{8}$ grain every half-hour in the vomiting of pregnancy. As an ointment it is used in painful skin diseases, as shingles; in facial neuralgia and in pruritus.

Pastilles are made of various strengths from $\frac{1}{20}$ to $\frac{1}{6}$ grain in each, usually $\frac{1}{20}$ or $\frac{1}{10}$ grain. It is also supplied in granular effervescent form containing Cocaine Hydrochloride $\frac{1}{20}$, $\frac{1}{10}$, $\frac{1}{5}$, $\frac{1}{2}$ grain in each teaspoonful.

Hypodermic Tablets are supplied containing $\frac{1}{10}$, $\frac{1}{6}$, $\frac{1}{4}$, $\frac{1}{2}$ grain; also Cocaine Hydrochloride $\frac{1}{50}$ grain, Homatropine Hydrobromide $\frac{1}{50}$ grain, in each.

Hypodermic solutions are used containing 4 to 10 p.c. of the salt.

For external application in neuralgia, 10 or 20 p.c. solution of the *alkaloid* in Oil of Cloves, and a weaker solution 5 p.c. for toothache and earache.

10 p.c. solution applied on Lint or Cotton-Wool to a rigid os uteri is followed by rapid dilatation.—*B.M.J.* '98, ii. 1374; '00, i. 1340.

In pertussis, dose $\frac{1}{16}$ grain three times daily for infants, increasing it according to the age, $\frac{1}{3}$ grain being given to children of 5 or 6 years.—*L.* '95, i. 1429; *B.M.J.E.* '95, ii. 28.

Combined with Opium in the internal treatment of cancerous disease.—*B.M.J.* '96, ii. 718.

Four cases in which toxic symptoms have followed anæsthesia of the throat. —*B.M.J.E.* '96, ii. 95.

Used with a laryngeal syringe, shown (*B.M.J.* '04, ii. 1221) to be a satisfactory method of producing local anæsthesia during operation on the larynx.

Uncertain as a mydriatic, and cannot be relied upon to produce maximum dilatation of the pupil.—*B.M.J.* '99, ii. 775.

A useful modification of the usual method of using Cocaine in operation upon the eyeball is given (*B.M.J.* '04, ii. 1303); an ointment has been advocated in combating photophobia (*B.M.J.* '04, ii. 1301), being stated not to produce desiccation of the corneal epithelium.

In cocainisation of the spinal canal, 2 c.c. of a freshly prepared sterilised 2 p.c. solution ($\frac{1}{5}$ grain), and the quantity should not be exceeded or toxic symptoms may arise. Headache following operation is checked by Phenacetin in 10-grain doses or by Nitroglycerin or Hyoscine Hydrobromide.—*L.* '02, i. 912, 1051.

$\frac{1}{3}$-grain doses into spinal canal, preceded in some cases by hypodermic injection of 10 minims Liquor Strychninæ.—*L.* '02, ii. 864.

Injection of Cocaine into the nerve-trunks about their point of division before an operation, and the administration of Morphine before it, tend to prevent shock (*L.* '05, ii. 579). For the induction of spinal anæsthesia in the treatment of Strychnine poisoning and of tetanus, 1 or 2 c.c. of a 1 p.c. solution of Cocaine Hydrochloride is injected into the spinal subdural space. Not more than $\frac{1}{2}$ grain should be injected at once, and it is well to commence with a much smaller quantity.

1 or 2 c.c. of a 3 p.c. solution of Eucaine B Hydrochloride may also be used. The solution may be sterilised by boiling without decomposition, is less toxic than Cocaine, and unpleasant or dangerous effects practically never attend its use.—*L.* '05, ii. 887.

Several fresh communications on the useful combination of Cocaine and Adrenalin have been made. The combined use is shown (*B.M.J.E.* '04, ii. 60) to cause increase of the analgesic property and to lessen toxic effect. Solution recommended, 10 c.c. of a 1 in 200 Cocaine Hydrochloride Solution, 10 minims of a 1 in 1000 Adrenalin Solution. Their separate use has sometimes been advocated (*B.M.J.* '04, ii. 1227) in operation on the larynx, the Cocaine being used as a spray, a more diffuse effect being required. Adrenalin Solution has been used locally, its application being most desired where bleeding is taking place.

Suggested as probable that in the long run weaker solutions than 2 p.c., say 1 in 100 to 1 in 400, will be used for intraspinal injection of Cocaine. The use of Eucaine suggested instead of Cocaine on account of its lesser toxicity and greater stability during sterilisation by heat.—*L.* '01, i. 137.

Lumbar injections of 0·1 gramme (= $\frac{1}{6}$ grain) during labour.—*L.* '01, ii. 365, 645.

The physiological effects of cocainisation of the spinal canal.—*L.* '01, ii. 1280.

Dangers of anæsthesia by injection of Cocaine into the spinal canal.—*L.* '01, i. 975.

An objection to the lumbar method of producing anæsthesia being employed as a routine practice on a large scale is the poisonous and treacherous character of the drug hitherto used, viz., Cocaine.—*B.M.J.* '07, ii. 869.

For local anæsthesia in the extraction of teeth, the best results are obtained with 1 p.c. solution of Cocaine combined with 5 p.c. of Adrenalin Chloride: danger of syncope and other accidents from Cocaine, due in most cases to carelessness or ignorance in the method; the same amount of Cocaine is more dangerous in a concentrated than in a weaker solution.—*B.M.J.* '07, i. 895.

Use of 10 p.c. solution for extraction of teeth strongly deprecated; 1 p.c. solution perfectly effective; dose should never exceed 1 grain.—*B.M.J.* '07, i. 788, 848. Death from urethral injection of 3 grains.—*B.M.J.* '06, ii. 868.

Cocaine intoxication and its demoralising effects.—*B.M.J.* '02, i. 1020, 1041.

Dose.—$\frac{1}{6}$ to $\frac{1}{2}$ grain = 0·01 to 0·03 gramme.

Ph. Ger. maximum single dose, 0·05 gramme; maximum daily dose, 0·15 gramme.

Prescribing Notes.—*Unless a preservative be used, solutions should be freshly prepared to prevent the development of a fungus. As solutions of Cocaine are damaged by heat, they must not be sterilised by boiling. Salicylic Acid is the best, if not the only effectual preservative for aqueous solutions of Cocaine, but it is very irritating to the eye. As Borax is incompatible with this salt, an equivalent quantity of Boric Acid should be prescribed.*

Incompatibles.—Alkalis and alkaline Carbonates, Borax, Carbolic Acid, Mercurous and Mercuric Chlorides, and the majority of soluble Silver salts.

Official Preparations.—Injectio Cocainæ Hypodermica, and Lamellæ Cocainæ. Used in the preparation of Trochiscus Krameriæ et Cocainæ.

Not Official.—Guttæ Cocainæ Hydrochloridi, Nebula Cocainæ, Pastillus Cocainæ, Pastillus Cocainæ et Morphinæ, Trochisci Cocainæ, Trochisci Cocainæ et Morphinæ, Cocainæ Citras, Cocainæ Hydrobromidum, Cocainæ Lactas, Cocainæ Nitras, Cocainæ Oleas, Cocainæ Phenylas, Cocainæ Salicylas, Cocainæ Sulphas, Eucaine, Eucaine Hydrochloride, Eucaine Lactate, Orthoform, Orthoform Hydrochloride, Benzoyl-Pseudotropeine, Holocaine, Holocaine Hydrochloride, Acoine Nirvanin, Nervocidine, Alypin, Novocaine, Stovaine.

Antidotes.—Inhalation of Nitrite of Amyl.—*B.M.J.* '87, i. 625, 695, 1401; 88, i. 757. Strychnine and Digitalin.—*L.* '98, i. 718.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Russ., Span., Swed., Swiss and U.S. Not in the others.

Tests.—Cocaine Hydrochloride possesses a melting point according to the *B.P.* of from 180° to 186° C. (356° to 366·8° F.), the *U.S.P.* states 189° C. (372·2° F.), mentioning that the presence of minute quantities of impurities may reduce the melting point to

180° C. (356° F.), or even less; the *Fr. Codex* (1908) gives 186° C. (366·8° F.); the *P.G.* gives 183° C. (361·4° F.). It should be perfectly free from colour, should be readily and completely soluble 2 in 1 of Water, forming a perfectly colourless solution, which should be absolutely neutral to Litmus paper. Its solutions are lævogyrate. Its aqueous solution yields with Ammonium Carbonate Solution and with Potassium, Sodium, or Ammonium Hydroxide Solution a white precipitate, amorphous when precipitated from strong solutions, but rapidly becoming crystalline. If this precipitate be dissolved in Ether, the ethereal solution separated, and the Ether carefully evaporated, the residue should respond to the distinctive tests given in the large type under 'Cocaine.' The salt should dissolve without change of colour in pure concentrated Sulphuric Acid or in pure Nitric Acid. On warming its solution in the former acid, it chars, at the same time evolving an agreeable aromatic odour, and yielding a crystalline sublimate of Benzoic Acid. Its aqueous solution affords, with Potassio-mercuric Iodide (Mayer's) Solution, a white precipitate, precipitation occurring even in very dilute solution; with Auric Chloride Solution, a yellow precipitate; with Sodium Biborate Solution, a white precipitate; with Picric Acid Solution, a yellow precipitate, rapidly becoming crystalline; with Mercuric Chloride Test Solution, slightly acidulated with Hydrochloric Acid, a white precipitate soluble in hot Water; with Platinic Chloride Solution, a yellow crystalline precipitate; with Palladous Chloride Solution (5 p.c.), followed by the addition of Chlorine Water, a red precipitate; with Chromic Acid Solution or with Potassium Bichromate Solution, followed by the addition of Hydrochloric Acid, a yellow crystalline precipitate. An aqueous solution of the salt should yield with Silver Nitrate Solution a curdy white precipitate, insoluble in Nitric Acid, and which, when filtered and washed is readily soluble in Ammonia Solution or in Potassium Cyanide Solution.

A mixture of equal parts of the salt and Mercuric Chloride is blackened when moistened with diluted Alcohol.

Iodine or Iodo-potassium Iodide (Wagner's) Solution precipitates Cocaine from its aqueous solutions, in very dilute solution the precipitate appears of a rose colour, in stronger solutions, brown. Upon the reaction of Cocaine with Iodine solution has been founded (*P.J.* '01, i. 553; '01, ii. 222; *J.S.C.I.* '01, 1031; *J.C.S. Trans.*, '01, 675) a process for the determination of Cocaine. The Cocaine solution should contain about 1 gramme of the alkaloid in the form of a salt in 100 c.c. The Deci-normal Volumetric Iodine Solution should be added in excess, and the excess of Volumetric Iodine Solution titrated with Deci-normal Volumetric Sodium Thiosulphate Solution. Cocaine can be fairly accurately determined by this method, in the presence of Ecgonine, but not in the presence of Benzoyl Ecgonine. As, however, neither Ecgonine nor Benzoyl Ecgonine are extracted from aqueous alkaline solution by Petroleum Ether or Ether, a method of separation is available. Cocaine is readily extracted by these immiscible solvents. Assuming the production of Cocaine Di-iodo-hydriodide as a result of the reaction, one molecular quantity of Cocaine is necessary for each molecular quantity of Iodine used.

The more generally occurring impurities are Cinnamyl-Cocaine, Cocamine and other products derived from Cocaine, amorphous alkaloids, Sulphates, excess of moisture, and mineral matter. A great deal of controversy has raged round the tests adopted for the detection of these impurities. As a test for the presence of Cinnamyl-Cocaine, Cocamine and other products derived from Cocaine, the *B.P.* utilises the Permanganate Test. An excess of Potassium Permanganate Solution is added to a 1 p.c. solution of the Cocaine salt, when a copious red precipitate is produced, which is required not to undergo any alteration in colour within an hour. It is not clear how the *B.P.* proposes to observe the alteration in colour of the red crystalline precipitate in the presence of an excess of Potassium Permanganate Solution. The value of results yielded by the Potassium Permanganate Test depends entirely upon the method of carrying it out, and the conditions appear to have been completely misinterpreted; the test as officially described is therefore worthless. The Cocaine solution requires to be of such a dilution that Cocaine Permanganate is not precipitated, and the Potassium Permanganate Solution requires to be sufficiently weak to just colour the liquid. The test may be well applied as follows:—Dissolve 0·1 gramme of the salt in 5 c.c. of Water acidulated with 3 drops of Diluted Sulphuric Acid and add 0·5 c.c. of a 1 in 1000 Potassium Permanganate Solution. The colour should not disappear within an hour. The *U.S.P.* test is on similar lines to the above, but 3 drops of Deci-normal Volumetric Potassium Permanganate Solution are used, and the violet colour which is produced should not fade in half an hour. The *P.G.* uses 5 drops of Potassium Permanganate Solution (0·1 p.c. w/w), and states that when protected from dust no perceptible decolorisation should occur in half an hour.

According to Paul and Cownley, the most efficient test for ascertaining the purity of the salt for medicinal purposes is Maclagan's Test. 1 grain of the salt is dissolved in 2 fl. oz. of Water, 3 drops of Ammonia Solution (*B.P.*) added, and the mixture stirred briskly with a glass rod; within a few minutes a crystalline precipitate should be thrown down, leaving no turbidity in the supernatant liquid. The *B.P.* idea of the test is as follows:—A weighed quantity of 0·1 gramme of the salt is dissolved in 100 c.c. of Water and 0·25 c.c. of Ammonia Solution added. It should afford a clear solution from which a crystalline deposit should gradually separate on stirring. The quantities given in the *B.P.* translated into the terms of Maclagan's Test indicate 0·86 grain of the salt in 2 fl. oz. of Water and 5 drops of Ammonia Solution, or 1 grain of the salt in a little over 2¼ oz. of Water and 5 drops of Ammonia Solution; it will therefore be observed that the proportions are not strictly maintained. The *U.S.P.* maintains the same relative proportions of Cocaine salt to Water as in Maclagan's Test, but uses 4 instead of 3 drops of Ammonia Solution, and specifies 15 minutes as a limit of time for the appearance of the crystalline precipitate; the mixture should be vigorously stirred, and the sides of the beaker rubbed occasionally with the stirring rod. The *P.G.* adopts the same proportions of salt and Water as the *B.P.*, but after the addition of the Ammonia Solution allows the liquid to remain at rest for an hour, when no opalescence should be produced. The essential feature of the test is the strict maintenance of the original proportions.

Maclagan's Test has been subjected to a good deal of adverse criticism on the continent. Gunther (*C.D.* '99, i. 457) claimed to have discovered a new base (Ethyl-benzoyl-ecgonine), possessing a melting point of 110° to 111° C. (230° to 231·8° F.), and to have shown that the salts of Cocaine as generally found on the market, and as hitherto obtained, are not solely a compound of the alkaloid Cocaine with an individual acid, but that the Cocaine is associated with an isomeric alkaloid. The isomeric Hydrochloride gives the Maclagan's Ammonia reaction quickly and distinctly even in 1 in 2500 solution, whereas a 1 in 1000 Cocaine Hydrochloride solution does not give any crystallisation whatever on the addition of Ammonia Solution as prescribed by the test. He concludes, therefore, that the crystallisation is not due to the Cocaine at all, but to the isomeride. Although endeavours have been made (*P.J.* '99, i. 25) in various ways to obtain evidence of the existence of this high melting point base, no base having a melting point of 111° C. (231·8° F.) could be obtained, and only 0·00006 of a base melting at 104° to 108° C. (219·2° to 222·8° F.), which was quite insufficient to account for the crystalline precipitate in Maclagan's Test.

Notwithstanding the adverse criticism to which the Maclagan Test has been subjected, it has been conclusively shown (*P.J.* '98, i. 449, 473, 586; '99, i. 431, 523, 524; '99, ii. 25, 66; *C.D.* '98, i. 511; '99, i. 897; *Merck's Annual Report*, '99, 51) that it affords the best guarantee of the purity of Cocaine Hydrochloride, and that any sample which does not satisfy the test should not be regarded as sufficiently pure for pharmaceutical purposes.

Schaefer (*C.D.* '99, i. 591; *P.J.* '99, i. 336) formulates a new test depending upon the relative solubilities of Cocaine Chromate and the residual alkaloidal Chromates in Water and in Water acidulated with Hydrochloric Acid. A weighed quantity of 0·05 gramme of the specimen is dissolved in 20 c.c. of Water, mixed with 5 c.c. of a 3 p.c. Chromic Acid solution, and 5 c.c. of a 10 p.c. Hydrochloric Acid Solution is added, the temperature being maintained at 15° C. (59° F.). If more than traces of foreign Coca-bases be present, the solution becomes at once cloudy; if the Cocaine Hydrochloride be pure, a clear solution will result.

A new alkaloid isomeric with Cocaine, and called by Schaefer, Cocainidine, is stated (*C.D.* '99, i. 602; *P.J.* '99, i. 359) to have been found in Coca Leaves, and in commercial samples of Cocaine Hydrochloride. Schaefer's Chromic Acid Test has been critically examined in the author's laboratory (*C.D.* '99, i. 641, 702). Six specimens of pure Cocaine Hydrochloride obtained from manufacturers of the highest repute were subjected to the test. All gave distinct turbidity, either immediately or after a few seconds. A specimen of Cocainidine

Hydrochloride was also examined, and gave a distinct turbidity at once. Dr. Schaefer's Chromic Acid Test therefore produces a turbidity in solutions of the best commercial samples, and also of his Cocainidine Hydrochloride. The base obtained by treating an aqueous solution of Cocainidine Hydrochloride with Ammonia Solution, when washed, and dried over Sulphuric Acid, had the same melting point as the base obtained on similarly treating one of the best samples of Cocaine Hydrochloride, viz., 98° C. (208·4° F.).

It was subsequently mentioned (*C.D.* '99, i. 745) that the specimen of Cocainidine Hydrochloride submitted contained Isotropyl-Cocaine.

It has been demonstrated (*C.D.* '99, i. 897; *P.J.* '99, i. 523) that the concentration of the Hydrochloric Acid plays an important part in the test, as does also the age of the Chromic Acid solution. The same sample of Hydrochloride gave a precipitate on the addition of 10 p.c. acid, but with 7·5 p.c. the solution remained clear; whilst another sample was satisfactory with 10 p.c. of acid, but precipitated with 12·5 p.c. A freshly-prepared Chromic Acid solution, which remains quite clear when added to solution of the sample, after 24 to 48 hours' standing will produce a precipitate.

Schaefer endeavours (*P.J.* '99, i. 66) to meet the criticisms which have been levelled against the test by stating that the finest commercial brands of Cocaine Hydrochloride answer the test satisfactorily. The Chromates of the amorphous alkaloids are far less soluble in solutions containing the higher percentage of Hydrochloric Acid. An acid of 10 p.c. was decided upon, and if the reaction is carried out with a stronger acid it is necessary to do so side by side with a specimen of chemically pure Cocaine, as at a low temperature Cocaine Chromate causes a turbidity in the more acid solution. His own experience fails to confirm Merck's remarks *re* the age of the Chromic Acid solution. The all-important feature of the test is that a temperature of 15° C. (59° F.) should be maintained. Notwithstanding this the value of the Chromate Test is generally held to be questionable, and there is no doubt that the Maclagan Test is far preferable. Cownley (*P.J.* '99, i. 336; '99, ii. 66) is of opinion that probably the only salt that would pass the test would be one prepared from synthetic Cocaine.

Both *U.S.P.* and *P.G.* includes a test with Chromic Acid Solution. The *U.S.P.* employs 5 c.c. of a 2 p.c. solution of the Cocaine salt, the *P.G.* a solution of 0·5 gramme of the alkaloidal Hydrochloride in 5 c.c. of Water, and both add 5 drops of a 5 p.c. Chromium Trioxide Solution. A yellow precipitate is produced, which redissolves on shaking the mixture, but is reprecipitated as a permanent orange-coloured crystalline precipitate on the addition of 1 c.c. of Hydrochloric Acid.

Messrs. Zimmer and Co. point out (*P.J.* '99, ii. 315) that a salt which does not give a crystalline precipitate by Maclagan's Test within 5 minutes should be rejected as being too impure, since the time required to obtain a precipitate serves as an index of purity.

The aqueous solution of Cocaine Hydrochloride when acidified with Diluted Hydrochloric Acid shall yield no opalescence or precipitate with Barium Chloride Solution, indicating the absence of Sulphates.

The formula given in the *B.P.* represents the anhydrous salt. It is officially required to lose not more than 1·0 p.c. of moisture as determined by drying a weighed quantity for 20 minutes at a temperature of 95·6° to 100° C. (204° to 212° F.); the *P.G.* states that it suffers no loss of weight at 100° C. (212° F.). The Brussels Convention recommends only the anhydrous salt should be recognised. The presence of mineral matter is at once detected by the residue left on ignition; no weighable residue should remain when 0·5 to 1 gramme of the salt is heated to redness with free access of air.

Preparations.

INJECTIO COCAINÆ HYPODERMICA. Hypodermic Injection of Cocaine.

Dissolve $\frac{1}{2}$ grain of Salicylic Acid in 6 fl. drm. of boiled Distilled Water; add 33 grains of Cocaine Hydrochloride, dissolve, and if necessary add Distilled Water (recently boiled and cooled), *q.s.* to produce 6 fl. drm. (1 in 10)

Dose.—By subcutaneous injection, 2 to 5 minims = 0·12 to 0·3 c.c.

11 minims contain 1 grain of Cocaine Hydrochloride.

Foreign Pharmacopœias.—Official in Mex. and Span. 1 in 100.

LAMELLÆ COCAINÆ. Discs of Cocaine.

Gelatin discs, containing $\frac{1}{50}$ grain of Cocaine Hydrochloride.

Four times the strength of *B.P.* '85, which contained $\frac{1}{200}$ grain.

Ophthalmic discs, each containing about 0·0005 gramme = $\frac{1}{120}$ grain Cocaine Hydrochloride, are official in Ital. Ph.

They are also supplied containing Cocaine $\frac{1}{200}$ grain with Atropine $\frac{1}{5000}$ grain; Cocaine $\frac{1}{200}$ grain with Physostigmine $\frac{1}{1000}$ grain; and Cocaine $\frac{1}{100}$ grain with Homatropine $\frac{1}{100}$ grain.

TROCHISCUS KRAMERIÆ ET COCAINÆ. *See* Krameria.

Not Official.

GUTTÆ COCAINÆ HYDROCHLORIDI.—Cocaine Hydrochloride, 10 grains; Distilled Water, 1 fl. oz.—*London Ophthalmic.*

NEBULA COCAINÆ.—Cocaine Hydrochloride, 48 grains; saturated solution of Boracic Acid, 1 fl. oz.—*Central Throat.*

PASTILLUS COCAINÆ.—$\frac{1}{10}$ grain of Cocaine Hydrochloride in each (*Throat*); $\frac{1}{20}$ grain (*St. Thomas's*). *Fr.* has Tablettes de Chlorhydrate de Cocaine, each containing $\frac{1}{64}$ grain of Cocaine Hydrochloride.

PASTILLUS COCAINÆ ET MORPHINÆ.—Cocaine Hydrochloride, $\frac{1}{15}$ grain; Morphine Hydrochloride, $\frac{1}{30}$ grain.—*Martindale*; incorporated in the *B.P.C.*

Useful for coughs.

TROCHISCI COCAINÆ.—$\frac{1}{10}$ grain.—*Central Throat* and *Throat.*

TROCHISCUS COCAINÆ ET MORPHINÆ.—Cocaine Hydrochloride, $\frac{1}{20}$ grain; Morphine Hydrochloride $\frac{1}{30}$ grain.—*St. George's.*

COCAINÆ CITRAS.—Colourless, hygroscopic crystals, readily soluble in Water. Used in dentistry.

COCAINÆ HYDROBROMIDUM.—Transparent prisms, soluble in Water.

COCAINÆ LACTAS.—A white semi-solid, readily soluble in Water. Used as an injection in tubercular cystitis.

COCAINÆ NITRAS.—Large, tabular crystals, readily soluble in Water and in Alcohol (90 p.c.). Used in ophthalmic practice and in urethral surgery in conjunction with Silver Nitrate.

Tests.—The aqueous solution yields the tests distinctive of Cocaine given under Cocaine and Cocaine Hydrochloride. The aqueous solution decolorises Indigo Sulphate Solution containing an excess of Sulphuric Acid. When a solution of Ferrous Sulphate is poured carefully upon a well-cooled mixture of equal parts of Sulphuric Acid and a solution of the salt, a brown or purple-brown coloration is formed at the junction of the two fluids. When warmed with Copper and Sulphuric Acid reddish-brown fumes are evolved. It should leave no weighable residue when ignited with free access of air.

COCAINÆ OLEAS.—A crystallisable salt, insoluble in Water, soluble in Oleic Acid and fixed Oils. Is useful when a salt of Cocaine is required in a fatty basis such as an ointment or suppository.

COCAINÆ PHENYLAS (Cocaine Carbolate).—A yellow, or yellowish-brown, semi-solid mass. Insoluble in Water, soluble in Alcohol (90 p.c.) and in Ether. Introduced as a local anæsthetic, analgesic and sedative. Combined with Acetanilide it is stated to have been found useful in gastralgia in doses of 1½ grains daily. 1 drop of a 10 p.c. alcoholic solution of the salt has been found useful in conjunctival catarrh. Has also been found useful in dentistry. Owing to its insolubility is not so rapidly absorbed, and the action is more prolonged.

Dose.—Internally, $\frac{1}{12}$ to $\frac{1}{6}$ grain = 0·005 to 0·01 gramme.

COCAINÆ SALICYLAS.—Short, thick, somewhat deliquescent crystals, soluble 5 in 1 of Water, 2½ in 1 of Alcohol (90 p.c.).

Dose.—$\frac{1}{6}$ to ½ grain = 0·01 to 0·032 gramme.
Has been recommended hypodermically in asthma.

Tests.—Cocaine Salicylate dissolves readily in Water, the aqueous solution yields the reactions distinctive of Cocaine given under Cocaine and Cocaine Hydrochloride.

The diluted aqueous solution yields with Ferric Chloride Test-solution a violet coloration.

COCAINÆ SULPHAS.—In prisms, or as a white, granular powder, soluble in Water.

EUCAINE.—Under this name two basic principles have been introduced. **Eucaine (A)** (Methylester of Benzoyl-*n*-methyl-tetra-methyl-gamma-oxy-piperidine-carboxylic Acid). **Eucaine (B)** (Benzoyl-vinyl-di-aceton-alkamine). Synthetic products resembling Cocaine both in chemical and physiological action.

Eucaine (B) is the base in general use. It is insoluble in Water, but readily soluble in Alcohol (90 p.c.) and in Ether. Soluble 1 in 1½ of Aniline Oil.

EUCAINE HYDROCHLORIDE.—There are two salts bearing this name, marked A and B, and prepared from the corresponding bases Eucaine A and Eucaine B. The B salt is that generally used in medicine, and it is the practice to dispense it when Eucaine Hydrochloride is ordered unless the A is specified.

Eucaine B Hydrochloride ($C_{15}H_{21}NO_2HCl$, eq. 281·54).—A fine white odourless crystalline powder, possessing a bitter taste followed by a feeling of numbness of the tongue.

Solubility.—1 in 40 of Water, 1 in 12 of Alcohol (90 p.c.), 1 in 4 of Aniline Oil.

Medicinal Properties.—A powerful local anæsthetic. It is not so generally effective as Cocaine, but is less toxic. Solutions of Eucaine salts may be sterilised by boiling without undergoing decomposition.

The B salt is superior to Eucaine Hydrochloride (A) for use in ophthalmic work, as it is free from the irritating effects of the latter, and is an equally powerful local anæsthetic. Used in 2 p.c. aqueous solution. 2 drops applied every three minutes until 10 drops have been used.—*B.M.J.* '97, i. 134; '97, ii. 1560; *L.* '00, i. 1106.

A 2 p.c. solution recommended for hypodermic use, 40 minims in two doses of 20 minims each distributed over three or four places.—*L.* '99, ii. 552.

5 to 8 p.c. usual strength of solution necessary to produce anæsthesia for minor surgical operations. Usual dose 20 minims, and as much as 120 minims used without unfavourable results.—*L.* '99, i. 137; '99, ii. 318.

10 to 15 minims of an approximately 5 p.c. solution made with equal parts of Aniline Oil and Alcohol (90 p.c.) for the production of local anæsthesia of the ear.—*L.* '00, i. 1125.

Solution recommended by Barker:—Eucaine Hydrochloride B, 1; Sodium Chloride, 8; Sterilised Water, 1000; Injection of 10 c.c. As much as 10½ oz. injected without any ill effects. Such an amount, however, rarely necessary. Powders containing sufficient of the two salts for two ordinary operations may be kept ready, and can be dissolved in the necessary quantity of water and boiled before use.—*L.* '99, i. 282; '00, i. 156.

Addition of 0·8 p.c. Sodium Chloride to solution of Eucaine improves its analgesic properties, and has also other desirable effects.

An improved solution (Barker's) for the production of local anæsthesia:—B Eucaine Hydrochloride, 0·2 gramme; Sodium Chloride, 0·8 gramme; Adrenalin Chloride, 0·001 gramme; Distilled Water, 100 grammes.—*L.* '03, ii. 204.

Herniotomy performed under local anæsthesia produced by the injection of 40 minims of a 1 p.c. solution, followed by 20 minims more of the same solution dropped into the wound during operation.—*L.* '03, ii. 530.

Hypodermic injection of 40 minims of a 7½ p.c. solution Eucaine Hydrochloride (equal to 2¾ grains of the drug) before operation of suprapubic cystotomy. —*L.* '00, i. 928.

The use of a solution of Cocaine Hydrochloride 10, B Eucaine 10, Aniline 50, Alcohol (90 p.c.) 50, for the production of local anæsthesia in the ear, nose and throat, in order to obviate the dangers of using strong Cocaine solutions. To avoid change of colour, the solutions are best kept separately; *e.g.*, as a 20 p.c. solution of Cocaine in Alcohol (90 p.c.), and a 15 to 20 p.c. solution of Eucaine (B) in Aniline Oil.—*L.* '01, i. 698.

30 minims of a 5 p.c. solution injected around bed of the finger-nail causes swelling and unhealthy blueness of the skin of finger tip.—*L.* '01, i. 1510. Pointed out in reference to above that Eucaine solutions should be boiled immediately before use, injected at body temperature, and the use of a syringe previously used for Morphia should be avoided.—*L.* '01, i. 1648.

Solutions recommended in ophthalmic work, 2 p.c.; in the urethra and bladder, 2 p.c.; for the nose and throat or as a paint or spray for mucous surfaces generally, 5 to 10 p.c.; and in dental work, 2 to 5 p.c.—*B.M.J.E.* '03, i. 36.

The relative toxicity of Cocaine and Eucaine.—*T.G.* '99, 689.

With reference to the use of strong solutions of these salts for hypodermic injections, it is pointed out they should not be used of greater strength than 3·0 p.c.; stronger solutions, being hypisotonic with the blood, are liable to produce sloughing of the tissues. Much useful information on the subject is to be found in a paper in the *B.M.J.* '04, ii. 1862, and the formula for a suitable solution is there given as Beta-Eucaine Hydrochloride, 0·2 gramme; Sodium Chloride, 0·8 gramme; Adrenalin Chloride solution (1 in 1000), 10 minims; Sterile Distilled Water, sufficient to make 100 c.c.

On the pharmaceutical side, the incompatibility of Salicylic Acid with Eucaine may be drawn attention to. This is a point of some importance, as the Pharmacopœia directs Salicylic Acid to be used as a preservative for Injectio Cocainæ Hypod.; but an attempt to carry this practice out with the Eucaine salt will result in precipitation, as the Salicylate is much less soluble.

Spinal anæsthesia induced by Eucaine B in the treatment of tetanus.—*L.* '05, ii. 888. The solution used consisted of Eucaine B Hydrochloride, 1½ grains; Morphine Sulphate, ⅛ grain; Sodium Chloride, 3 grains; Water, to

3½ oz. From 15 to 16 c.c. of cerebrospinal fluid were withdrawn, and injections of from 3 to 4 c.c. of the above fluid given at various intervals.

In sciatica (*B.M.J.E.* '05, i. 44), 72 to 100 c.c. of 10 p.c. solution of Eucaine in saline solution are injected into the nerve at its point of emergence.

It is by no means uncommon to be asked to make up solutions containing as much as 4 or 5 p.c. Although this can be accomplished easily by the aid of heat, the salt does not remain in solution, and even 3·2 p.c. solutions when prepared by the aid of heat do not remain bright long even when kept in hermetically-sealed capsules, but soon deposit tufts of crystals. On inquiry of the manufacturers, a letter resulted acknowledging the correctness of the *Companion* figures, and pointing out that as the solution has to be used at the body-temperature, any salt which crystallises out will again be taken into solution. The use of the stronger solutions of Eucaine has, however, lately been deprecated, and the valuable work recorded in the *B.M.J.* has shown that inasmuch as they are hypisotonic with the blood, they are liable to produce necrosis of the tissues if used for the purposes of hypodermic injection.

Foreign Pharmacopœias.—Official in Dan. and Swiss (Trimethylbenzoxypiperidinum-hydrochloricum).

Tests.—Eucaine (B) Hydrochloride possesses a melting point of 268° C. (514·4° F.). A weighed quantity of 0·1 gramme dissolved in 10 c.c. of Water yields on the addition of 1 drop of Ammonia Solution a crystalline precipitate, which redissolves, but is again thrown down on the further addition of Ammonia. The precipitate caused by 4 drops of Ammonia Solution completely dissolves on the further addition of 20 c.c. of Water. On again adding 4 c.c. of Ammonia Solution the precipitate forms again, and is again dissolved on the addition of 10 c.c. of Water, but no further precipitate is formed on the addition of Ammonia Solution, only a milky cloudiness, disappearing on the addition of Water.

A 1 p.c. aqueous solution yields with Potassium or Sodium Hydroxide Solution a precipitate of the free base, which dissolves readily in Ether. Mercuric Chloride Solution produces no precipitate. The aqueous solution yields a precipitate with Mayer's reagent and lemon yellow precipitate with Picric Acid Solution. If a crystal be moistened with Nitric Acid and evaporated to dryness, it leaves a colourless residue, which evolves a characteristic odour of Benzoic Acid Ethyl-Ester when moistened with an alcoholic Potassium Hydroxide Solution.

The aqueous solution acidified with diluted Nitric Acid yields on the addition of Silver Nitrate Solution a white curdy precipitate insoluble in Nitric Acid, readily soluble in Ammonia Solution.

It may be distinguished from Alpha-Eucaine by the 1 p.c. aqueous solution yielding no precipitate on the addition of a few drops of 10 p.c. Potassium Iodide Solution, Alpha-Eucaine Solution yielding under similar conditions a crystalline precipitate.

It may be distinguished from Cocaine by mixing a little of the salt with some Mercurous Chloride and moistening the mixture with Alcohol (90 p.c.), when no darkening in colour should be noticed. Cocaine under similar conditions immediately darkens in colour. Eucaine (B) Hydrochloride should dissolve without change of colour in concentrated Sulphuric or Nitric Acid.

It should leave no weighable residue upon ignition with free access of air.

Eucaine Lactate ($C_{15}H_{21}NO_2C_3H_6O_3$, eq. 334·72).—A white odourless crystalline powder possessing a bitter taste, and subsequently producing a feeling of numbness of the tongue. It has been introduced as a local anæsthetic, which is claimed to be more soluble than the Hydrochloride.

Solubility.—1 in 4 of Water; 1 in 8 of Alcohol (90 p.c.).

It is usually employed in the form of a 2 to 3 p.c. solution.

ORTHOFORM.—This base is Para-amido-meta-hydroxybenzoic Acid Methyl Ester, a synthetic product introduced as a substitute for Cocaine. A white, odourless, tasteless, crystalline powder, or in colourless crystals melting at 120° C. Soluble, 1 in 450 of Water; 1 in 6 of Alcohol (90 p.c.); 1 in 13½ of Ether.

Another base, Meta-amido-para-hydroxybenzoic Acid Methyl Ester, has been introduced under the name of '**Orthoform New.**' Solubility is practically the same as above.

Medicinal Properties.—Local anæsthetic employed in ulcerations of the upper air passages. Useful where nerve endings are exposed, but has no action on unbroken skin and but little on healthy mucous membrane. Best administered as a **spray**, using 10 p.c. solution made with Alcohol (45 p.c.), but the powder may be employed either alone or mixed with an equal quantity of Lycopodium for **insufflation**, or in the form of a 10 p.c. **ointment**; a saturated solution of Orthoform in **Collodion** is used as a varnish. Said to be of value as an anodyne in ulcer or cancer of the stomach in doses of 8 to 16 grains. An aqueous solution of the **Hydrochloride** is used as a **paint**.—*B.M.J.* '98, i. 362; *Pr.* lxi. 505.

Non-toxic and powerfully antiseptic. On account of its sparing solubility it is but slowly absorbed. Nearly 2 oz. have been employed in the course of a week for dusting wounded surfaces without injurious effect.—*B.M.J.E*, '97, ii. 55; *P.J.* '97, ii. 277; *B.M.J.* '98, i. 362.

As an ointment it is useful in burns; in ulcers of the leg and in syphilitic ulcers.—*L.* '98, i. 1024; *B.M.J.E.* '98, i. 76; *P.J.* '98, ii. 661.

Used (suspended in Glycerin) for intra-uterine medication.—*L.* '98, i. 1434.

Cotton-Wool plug steeped in an alcoholic solution introduced into the cavity of a tooth for the relief of toothache.—*T.G.* '99, 270; *P.J.* '99, i. 83.

In fissure of the nipple.—*T.G.* '99, 337.

As an insufflation in stomatitis in children.—*B.M.J.E.* '99, i. 75.

Insufflated, dusted on, or used as an ointment is most efficient (*B.M.J.* '05, ii. 1008) in allaying pain, in burns, ulcerative stomatitis, tuberculosis and malignant ulceration, whether of the larynx or other regions. Or it may be given internally up to 3 grains for gastric ulcer, carcinoma, or nervous dyspepsia.

As an emulsion, Orthoform, 25; Olive Oil, 100; as an insufflation, 10 to 20 centigrammes; or as a 10 p.c. aqueous solution of the Hydrochloride for laryngeal application.—*B.M.J.E.* '99, i. 20, 64.

ORTHOFORM HYDROCHLORIDE.—A white, crystalline powder, which is soluble, 1 in 8·4 of Water, 1 in 17 of Alcohol (90 p.c.). Insoluble in Ether. It may be employed for internal administration or for urethral injection, but is too acid for hypodermic injection or application to the eye.—*L.* '97, ii. 738; *B.M.J.E.* '97, ii. 55. Injection of a 10 p.c. solution in gleet.—*L.* '97, ii. 738.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

BENZOYL-PSEUDOTROPEINE (Tropacocaine, Tropain).—First obtained from Java Coca Leaves and afterwards made synthetically. The **Hydrochloride** has been used to produce anæsthesia of the eye during operations; it is much less toxic than Cocaine.—*B.M.J.* '92, ii. 406; '94, ii. 598; *L.* '94, ii. 598; *T.G.* '94, 653; *M.A.* '93, 52.

0·05 gramme (= $\frac{3}{4}$ grain) in 1 c.c. (16 minims) Water as an injection into the spinal canal to produce analgesia.—*B.M.J.E.* '02, i. 75.

0·05 gramme (= $\frac{3}{4}$ grain) dissolved in 5 c.c. (80 minims) of cerebrospinal fluid and reinjected to induce anæsthesia without undesirable concomitants.—*Merck's Report*, '02, 166.

Intraspinal injection of 1 c.c. of a 5 p.c. solution in puerperal eclampsia.—*B.M.J.E.* '02, ii. 6.

Intraspinal injection in doses of 0·07 gramme ($1\frac{1}{14}$ grain).—*L.* '05, ii. 561.

Of the drugs that now hold the field in lumbar anæsthesia, Stovaine, Novocaine, Alypin, and Tropacocaine, the most recent publications indicate a growing preference for the last named as the most reliable and the least dangerous.—*B.M.J.* '07, ii. 1002, and 873.

Dose for this purpose 1 c.c. of a 5 p.c. solution; addition of Adrenalin wholly unnecessary.—*B.M.J.* '07, ii. 873.

HOLOCAINE (Para-diethoxy-ethenyl-diphenyl-amidine).—A synthetic product introduced as a substitute for Cocaine. In colourless crystals which melt at 121° C. (249·8° F.). Insoluble in Water, readily soluble in Alcohol (90 p.c.) and Ether.

A powerful base, forming sparingly soluble salts with acids.

HOLOCAINE HYDROCHLORIDE.—The Hydrochloride of the above base. Occurs in colourless, needle-shaped crystals.

Solubility. 1 in 50 of Water; 1 in 6 of Alcohol (90 p.c.).

Medicinal Properties. Used in the form of 1 p.c. solution in ophthalmic surgery. Produces complete and rapid anæsthesia without pain, and neither dilates the pupil nor affects the blood-vessels. On account of its toxicity, it cannot be used hypodermically. Its instillation into the eye causes a slight feeling of burning which rapidly passes off.—*L.* '97, i. 1466; *B.M.J.* '98, ii. 619; *B.M.J.E.* '97, i. 55, 75, 87, 92; '98, i. 99; *Pr.* lxi. 503.

A 1 p.c. solution did not show the slightest cloudiness when allowed to stand in an open vessel for two months.—*P.J.* '97, i. 368.

It is stated to possess the following advantages: (1) it does not cause mydriasis; (2) does not affect accommodation; (3) causes deeper anæsthesia of the iris; (4) often proves efficient in cases of painful inflammation where Cocaine fails; (5) produces no toxic effects unless injected subcutaneously or swallowed; (6) has no effect on the corneal epithelium; (7) is strongly bactericidal in action. The solutions should be preserved in porcelain and not in glass vessels.—*T.G.* '99, 322, 612; *B.M.J.E.* '99, ii. 20; *Pr.* lxiv. 476; *M.A.* '00, 28.

As a local anæsthetic in ophthalmic practice should not be used in stronger doses than 1 p.c., as it is poisonous.—*L.* '05, ii. 835.

It is stated (*L.* '06, ii. 15) to be a most valuable addition to Cocaine in all operations in which it is necessary to cut the iris. The favourite combination recommended is Cocaine Hydrochloride, 2 p.c.; Holocaine Hydrochloride, 1 p.c.; dissolved in solution of Adrenalin Hydrochloride, 1 in 1000, and freshly prepared immediately before being used.

ACOINE (Di-para-anisyl-mono-phenetyl-guanidine hydrochloride).—A white, crystalline powder, soluble 1 in 50 of Water. Introduced as a substitute for Cocaine as being less toxic.

A useful solution for producing anæsthesia is Acoine, 1; Sodium Chloride, 8; Distilled Water, 1000. Concentrated solutions should not be employed, as they give rise to irritation. The solutions, moreover, should not be exposed to the light.—*L.* '99, i. 1372; *B.M.J.* '99, i. 1340; *P.J.* '99, i. 538; *C.D.* '99, i. 701.

In subconjunctival injections as a local anæsthetic; no pain was produced when a mixture of equal parts of a 1 in 1000 solution of Mercury Cyanide and a 1 in 100 Acoine solution was injected.—*L.* '99, ii. 1082.

Solutions of 1 in 100 and 1 in 300 produce satisfactory anæsthesia in an unirritated eye; when there was much congestion it failed.—*T.G.* '99, 697; *B.M.J.E.* '99, ii. 76.

NIRVANIN (Hydrochloride of Diethyl-glycocoll-para-amido-ortho-hydroxybenzoic Methyl Ester).—Small white prisms, readily soluble in Water. Introduced as a local anæsthetic in surgical and dental operations. As a substitute for Cocaine and Orthoform, generally used in the form of a 2 p.c. solution. A 5 p.c. solution causes irritation when dropped into the eye. As much as 7 grains may be injected hypodermically without injury. A 1 p.c. solution has a marked bactericidal action.—*P.J.* '99, i. 95, 481; *C.D.* '99, i. 701.

NERVOCIDINE.—A yellow, hygroscopic, amorphous powder, readily soluble in Water, slightly soluble in Alcohol (90 p.c.) and in Ether. It is obtained from an Indian plant 'Gasu-Basu.' Introduced as a local anæsthetic. The irritation which it produces, the length of time required to produce anæsthesia, and its liability to produce toxic symptoms, however, preclude its general use. At present its employment is restricted to dental work.—*L.* '02, i. 127; *P.J.* '02, ii. 211.

ALYPIN. Primary Benzoyl - tetramethyldiamino - ethyldimethylcarbinol Monohydrochloride. $C_{16}H_{26}N_2O_2 \cdot HCl$, eq. 312·39.

A non-hygroscopic odourless crystalline powder.

Solubility.—1 in 1 of Water; 1 in $1\frac{1}{2}$ of Alcohol (90 p.c.); insoluble in Ether.

Dose.—$\frac{1}{10}$ to $\frac{1}{2}$ grain = 0·0064 to 0·032 grain.

It was introduced as a local anæsthetic. It is stated (*L.* '05, ii. 321) to be easily absorbed by the mucous membranes and the subcutaneous tissue. It has a similar anæsthetic action to Cocaine. Solutions should always be freshly prepared; they may be sterilised by boiling without impairing their anæsthetic action.

Enthusiastic account of it as a local anæsthetic. A 1 p.c. solution was used; it can be sterilised by boiling without spoiling, and it produces no bad effects, either general or local. Severe operations of considerable duration were performed with complete anæsthesia. The anæsthesia was given locally and never by lumbar puncture.—*B.M.J.E.* '07, ii. 84.

Nearly the equal of Cocaine in anæsthetic action; complete anæsthesia of the eye can be produced by a 1 or 2 p.c. solution in a minute.—*B.M.J.E.* '07, i. 52.

Tests.—Alypin loses a small quantity of moisture when dried at a temperature of 100° C. (212° F.), the loss being equivalent to about 4·5 p.c. The dried salt melts at about 170° C. (338° F.). It dissolves readily in Water, yielding a solution which is neutral in reaction towards Litmus paper. The aqueous solution yields a precipitate with the usual alkaloidal precipitants, *e.g.*, Potassio-mercuric Iodide (Mayer's) Solution, Iodo-potassium Iodide (Wagner's) Solution, Picric Acid Solution, etc. It also yields precipitates with Potassium or Sodium Hydroxide Solution and with Ammonia Solution, but is not precipitated by dilute Sodium Bicarbonate Solution. The aqueous solution acidified with diluted Nitric Acid yields on the addition of Silver Nitrate Solution a white curdy precipitate insoluble in Nitric Acid, and if the precipitate be separated and washed, it is soluble in Ammonia Solution and Potassium Cyanide Solution. If a minute quantity of the salt be placed on the tongue it produces a characteristic sense of numbness resembling that produced by Cocaine. When ignited with free access of air the salt should leave no weighable residue.

NOVOCAINE.—Para-aminobenzoyl-diethylamino-ethanol Hydrochloride. $C_{13}H_{20}N_2O_2HCl$, eq. 270·66.

A white odourless crystalline powder which is readily soluble in cold Water. The aqueous solutions are neutral in reaction towards Litmus paper, and can be boiled without decomposition. It is introduced as a local anæsthetic, and is stated to be free from irritant action on living tissues. It is used chiefly in the form of solution, or as tablets, the powder having been withdrawn from the market. For hypodermic use the solutions vary in strength from a ¼ to 2 p.c. For infiltration anæsthesia and for anæsthesia of thick layers of tissue ¼ to ½ p.c. isotonic solutions are used; for anæsthesia of the nerve-centres and larger nerve-trunks 1 to 2 p.c. isotonic solutions are employed; for medullary anæsthesia a 5 p.c. isotonic solution has proved most useful. In ophthalmic practice 5 and 10 p.c. solutions are chiefly employed and produce no dilatation of the pupil or irritation; solutions of similar strength are employed in operations or explorations of the throat and nose; 10 to 20 p.c. solutions for anæsthesia of the larynx and pharynx, and in dental practice 1 to 2 p.c. isotonic solutions.

The dose for internal administration is ½ to 1 grain.

Spinal and local anæsthetic. Advantages over Stovaine.—*B.M.J.* '07, ii. 876.

85 cases, results uniformly good; should always be combined with Adrenalin. —*L.* '07, ii. 1686.

160 cases, writer very well satisfied.—*F.T.* '07, 90.

A satisfactory local and spinal anæsthetic.—*B.M.J.E.* '08, i. 23.

The safest and most perfect of known local anæsthetics in teeth extraction.—*B.M.J.* '07, i. 1172.

STOVAINE.—The Hydrochloride of Alphadimethyl-aminopropanol Benzoate. $C_{14}H_{21}NO_2HCl$, eq. 269·63.

Small, white, odourless, glistening, lamellar crystals, or a white, inodorous, crystalline powder.

Solubility.—1 in 1¼ of Water; 1 in 4 of Alcohol (90 p.c.); insoluble in Ether.

Dose.—⅙ to ½ grain = 0·01 to 0·3 gramme.

It is a spinal anæsthetic and said to be only half as toxic as Cocaine.

20 grains have been frequently given hypodermically without any toxic effects. In ordinary surgical use 0·5 p.c. solution in Distilled Water or physiological solution is the most useful; if 1 minim of a 1 in 1000 Adrenalin solution be added to every 3 c.c., a still better result is obtained. Maximum dose of Stovaine is 40 to 50 grains, and of Adrenalin 0·001 gramme.—*B.M.J.E.* '05, i. 92.

In work upon the nose, throat and ear, a 5 p.c. solution was found (*B.M.J.E.* '05, ii. 43) to be equal in its effects to a 10 p c. solution of Cocaine. As a local anæsthetic for the larynx Stovaine gave fair results. No appearances of poisoning have been observed after its application. ½ to 1 p.c. aqueous solutions have been used by infiltration for the production of local anæsthesia. ½ to ¾ p.c. solutions of Stovaine act as powerfully as 1 p.c. solutions of Cocaine.—*B.M.J.E.* '05, ii. 95.

The chief physiological difference from Cocaine is that it is a vaso-dilator, not a vaso-constrictor, and further, it seems to have a tonic effect upon the heart. Hence the vascular system seems to escape all the harmful effects of Cocaine. Of great value for the production of anæsthesia by intraspinal injection in acute general peritonitis. The minimum dose that can be given without fear of respiratory paralysis is 0·5 c.c. of a 10 p.c. solution. If the anæsthesia is required low down in the leg, quite a small dose, often as little as 0·3 c.c. of a 10 p.c. solution, is sufficient. In acute cases the method of gradual injection is imperative. A commencing dose of 0·6 c.c. may be given as a minimum, and if at the end of 7 minutes it is obvious that the dose is too small, an extra 0·3 c.c. should be given until the extent of the anæsthesia required is obtained.—*B.M.J.* '06, i. 1089.

Notes on 100 cases; an excellent anæsthetic though a little uncertain in its action.—*B.M.J.* '07, ii. 14.

In 78 p.c. of the cases injected nephritis followed, and lasted from 6½ to 30 days. The kidneys were previously healthy. Kidney mischief is therefore an absolute contra-indication.—*B.M.J.* '07, ii. 1003.

For heavy meń a dose of 7 to 8 cg. is necessary; 5 to 6 for a person of medium weight. In most cases anæsthesia is obtained after five minutes, and lasts from three-quarters to one hour. For operations on the abdominal wall it is advisable to make the puncture in the third lumbar space.—*B.M.J.E.* '07, ii. 56.

The minimal dose that can be given without fear of respiratory paralysis is 0·05 gramme. As quite a small amount of Sodium Carbonate renders Stovaine inactive, the Water in which the syringe is boiled ought not to contain any. Has a distinct influence in protecting from surgical shock. Method of administering, dosage, etc., fully considered.—*B.M.J.* '07, ii. 869.

Barker finds a 5 p.c. solution in Distilled Water freezes at about − 0·58° C., Blood Serum freezing at − 0·56° C. If this were the only test, the solution should be isosmotic with the blood. If, however, a drop of blood is added to a little of a 4 or 5 p.c. solution of Stovaine, in five minutes the red blood corpuscles swell and become pale, and in ten minutes are almost invisible. In a really isotonic fluid, such as normal Saline (0·91 p.c. Sodium Chloride) or normal Glucose Solution (5 p.c. Glucose) the salts are seen unchanged in 24 or 48 hours. The formula suggested by Barker (*B.M.J.* '07, i. 670) is Stovaine, 10 grammes; Glucose, 5 grammes; Sterilised Distilled Water, to produce 100 c.c.

A second series of 100 cases of spinal analgesia in which this drug was employed is recorded by Barker.—*B.M.J.* '08, i. 248. The solution used contained 5 p.c. of Stovaine, and 5 p.c. of Glucose, in Water. It had a specific gravity of 1·023 as against 1·007 of the cerebrospinal fluid. The average amount of the solution usually injected was 1 c.c. = 0·05 gramme of Stovaine.

A report of 50 cases of analgesia produced by the intraspinal injection of Stovaine.—*L.* '08, i. 1058.

Suspicion expressed that some of the ill-effects reported abroad after spinal analgesia were due to the Adrenalin principle added, and not to the anæsthetic drug at all.—*B.M.J.* '07, i. 665; '08, 244.

Disadvantages: the analgesia is not reliable and of short duration, the bowels are frequently opened on the operating table, may cause respiratory paralysis, many deaths and several cases of permanent paralysis have followed the spinal injection of Stovaine.—*B.M.J.* '07, ii. 876.

Favourable results in 100 cases.—*B.M.J.* '07, ii. 12.

Fatal paralysis in a man after injection of 0·06 gramme.—*L.* '07, i. 45.

Tests.—Stovaine melts at 175° C. (347° F.). It dissolves readily in Water, forming a solution which is neutral in reaction towards Litmus paper. A weighed quantity of 0·5 gramme of Stovaine, evaporated with 1 c.c. of a mixture of equal parts of Hydrochloric and Nitric Acid on a water-bath, yields a colourless residue which has a pungent odour, and if to the residue 1 c.c. of Potassium Hydroxide

Solution be added and the mixture evaporated, the residue has a fruity odour and oily drops separate on the addition of Water. Its aqueous solution is precipitated by the chief alkaloid precipitants, *e.g.*, Potassio-mercuric Iodide (Mayer's) Solution, Iodo-potassium Iodide (Wagner's) Solution, Picric Acid Solution, etc. It also yields precipitates on the addition of Potassium or Sodium Hydroxide Solution, and on the addition of Ammonia Solution. The aqueous solution, when acidified with Nitric Acid, yields on the addition of Silver Nitrate Solution a white curdy precipitate insoluble in Nitric Acid, and which when separated and washed dissolves readily and completely in Ammonia Solution or in Potassium Cyanide Solution. 0·5 gramme of the salt when ignited with free access of air should leave no weighable residue.

COCCUS.

COCHINEAL.

FR., COCHENILLE; GER., COCHENILLE; ITAL., COCCINIGLIA; SPAN., COCHINILLA.

The dried fecundated female insect, *Coccus Cacti;* reared on *Nopalea coccinellifera*, and on other species of *Nopalea.*

When dried in the sun the insects are of an ash-grey colour with a silvery surface, but when killed by immersion in boiling Water they have a reddish appearance, and if dried by artificial heat they are black.

Used as a colouring agent.

Official Preparation.—Tinctura Cocci. Used in the preparation of Tinctura Cardamomi Composita and Tinctura Cinchonæ Composita.

Not Official.—Carmine, Glycerinum Carmini, Liquor Carmini, Liquor Coccineus, Glycerinum Cocci, Liquor Cocci, and Syrupus Coccionellæ.

Foreign Pharmacopœias.—Official in U.S. (Coccus), Jap. and Swiss (Coccionella), Fr. (Cochenille), Port. (Cochonilha), Mex. and Span. (Cochinilla). Not in the others.

Descriptive Notes.—The dried insect forming this drug is named *Coccus Cacti*, Linn., in the *B.P.*, and *Pseudococcus Cacti*, Burmeister, in the *U.S.P.* The dried insect is imported chiefly from Teneriffe, and is met with in commerce in four principal forms, known as silver grain, black grain, madres or zacatille, and granilla or siftings. The black grain consists of the insect dried by artificial heat, the silver grain is dried in the sun. The 'madres' consist of the female insect collected in March after the young are hatched, and the granilla consists chiefly of young insects sifted out. For the manufacture of Carmine the madres are preferred as, weight for weight, they yield more colour than before the young have left the mother. They are black and very concave on the under surface, not flat or slightly convex as in the ordinary silver and black grain. The silver grain is sometimes adulterated with Sulphate of Barium or Carbonate of Lead and other mineral matter to increase its weight or improve its appearance, and fetches a lower price than the black variety which is more rarely adulterated, and then only with Iron Sand, which is visible under a good lens. The size is given both in *B.P.* and *U.S.P.* as 5 mm. ($\frac{1}{5}$ in.) long. *B.P.* states that it is somewhat oval in outline, flat or concave beneath, convex above, transversely wrinkled, purplish-black or purplish-grey, easily reduced to powder, which is dark-red or puce-coloured. *U.S.P.* describes it as somewhat oblong and angular in outline, flat and concave beneath, convex above, externally purplish-grey or purplish-black, transversely wrinkled, easily pulverisable, yielding a dark-red powder.

Tests.—The *B.P.* requires that no insoluble powder should separate when the specimen is macerated in Water, and that the ash should not amount to more than 6 p.c. The *U.S.P.* limit of ash is also 6 p.c. The ash of Cochineal varies very much. Out of 44 samples examined in the author's laboratory 17 came within the *B.P.* limits, 3 yielded between 6 and 8 p.c. of ash, 23 exceeded 8 p.c., and 1 sample contained as much as 37·4 p.c. of ash.

A comparison of the colouring power of the Cochineal may be made by powdering the sample with some broken glass, macerating for 24 hours in Water, with intervals of frequent stirring, and filtering through paper. The clear filtered liquid may be compared with a similar product prepared from a standard specimen.

Preparation.

TINCTURA COCCI. Tincture of Cochineal.

1 of Cochineal in powder, macerated with 10 of Alcohol (45 p.c.). (1 in 10)

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Foreign Pharmacopœias.—Official in Dan., 1 in 5; Fr. and Mex., 1 in 10. By weight. Not in the others.

Tests.—Tincture of Cochineal has a specific gravity of about 0·950; contains about 2·5 p.c. w/v of total solids and about 45 p.c. w/v of Absolute Alcohol.

Not Official.

CARMINE.—Prepared from Cochineal, an excellent colouring agent for powders and ointments. It is also used as a staining agent in microscopy.

GLYCERINUM CARMINI.—Carmine, 3; Distilled Water, 3; Solution of Ammonia, *B.P.*, 4; dissolve and add gradually Glycerin, 18; heat in a water-bath till free from ammoniacal odour. When cold add solution of Ammonia, 1, to prevent gelatinisation, and Distilled Water, *q.s.* to 24.—*Martindale.*

B.P.C. is almost identical with this.

LIQUOR CARMINI.—Carmine, 6; Water of Ammonia (10 p.c.), 35; Glycerin, 35; Water, *q.s.* to yield 100.—*U.S.N.F.* 1896.

This has been incorporated in the *B.P.C.*, but in the *B.P.C. Supplement* it may be made in a similar way to Liquor Cocci, replacing the Cochineal by 6 of Carmine.

U.S.N.F. 1906 has altered the figures to 6·5, 36·5, 36·5 in 100.

LIQUOR COCCINEUS.—Cochineal, in No. 50 powder, 6; Potassium Carbonate, 3; Alum 3; Potassium Bitartrate, 6; Glycerin, 50; Alcohol (90 p.c.), 3; Distilled Water, *q.s.* to yield 100.—*U.S.N.F.* 1896.

GLYCERINUM COCCI.—Cochineal, unbruised, 20; Potassium Carbonate, 1; Potassium Citrate, 10; Glycerin, 20; Distilled Water, sufficient to produce 100.—*B.P.C.*

LIQUOR COCCI.—Cochineal, 20; Potassium Carbonate, 1; Potassium Citrate, 10; Alcohol, 20; Distilled Water, to produce 100. Dissolve the Potassium Carbonate in 60 of the Distilled Water and digest the unbruised Cochineal in the solution on a water-bath for 6 hours or until exhausted; then strain, cool, add the Alcohol and Potassium Citrate, and make up the required volume with Distilled Water.—*B.P.C.*

This is not an economical preparation, half the quantity of Cochineal will produce a solution of practically the same depth of colour. It is also an advantage to just bruise the Cochineal to a very coarse powder, but when not bruised it is necessary to assist the straining by gentle pressure, otherwise a considerable proportion of the liquid will be left in the marc. The process may be modified with advantage as follows:—Cochineal (in coarse powder), 10; Potassium Carbonate, 1; Potassium Citrate, 10; Alcohol, 20; Distilled Water, *q.s.* to make 100. Dissolve the Potassium Carbonate in 60 of Distilled Water, and digest the Cochineal in the solution on a water-bath for 3 hours, replace the Water lost by evaporation, then strain and cool, add the Alcohol and Potassium Citrate; pass more Distilled Water through the strainer to make the total volume 100. Filter. This modification applies also to the Glycerinum Cocci, adding the Glycerin and Potassium Citrate to the strained fluid.

SYRUPUS COCCIONELLÆ.—Cochineal, 10; Potassium Carbonate, 1; Rose Water, 150; Cinnamon Water, 150; digest for 4 hours, then filter; in each 100 parts of the filtrate dissolve Sugar, 160, and Alum, 0·1; boil and strain; all by weight.—*Austrian Elenchus.*

CODEINA.

CODEINE.

$C_{18}H_{21}NO_3,H_2O$, eq. 314·84.

A crystalline alkaloid (Methyl Morphine) obtained from Opium or synthetically from Morphine.

Solubility.—1 in 80 of Water; 1 in 24 of boiling Water; 1 in 2 of Alcohol (90 p.c.); 1 in 2 of Chloroform; 1 in 30 of Ether; 1 in 12 of Benzol; 1 in 85 of Liquor Ammoniæ; 1 in 58 of Ether, sp. gr. 0·720.

Medicinal Properties.—It stops or lessens the glycosuria in diabetes (an entire abstinence from starchy food being strictly observed) in doses of 1 grain 3 times a day, gradually raised to 2 grains. Useful in relieving the hacking cough of phthisis, in ovarian pain, and as a mild hypnotic.

It has a powerful action in allaying abdominal pain, and it can be pushed to a much greater extent than Morphine without causing drowsiness or interfering with the respiration or with the action of the bowels.—*B.M.J.* '88, i. 1214.

In $\frac{1}{4}$ to $\frac{1}{2}$ grain doses combined with Phenacetin has been stated to give relief from the severe headache and general paroxysms in malaria.—*Pr.* lxxiii. 682.

Dose.—$\frac{1}{4}$ to 2 grains = 0·016 to 0·13 gramme.

Swiss, maximum single dose, 0·1 gramme; maximum daily dose, 0·4 gramme.

Prescribing Notes.—*For coughs it is usually given in the form of syrup, linctus or pastils, or as a pill, using Powder of Gum Acacia and 'Diluted Glucose' as excipients. For diabetes it is sometimes combined with Extract of Cascara. Codeine Phosphate in solution is used for hypodermic injection.*

Official Preparations.—Syrupus Codeinæ from Codeinæ Phosphas.

Not Official.—Codeine Pastils, Linctus Codeinæ, Pilula Codeinæ Composita, Codeinæ Iodas, Apocodeinæ Hydrochloridum.

Foreign Pharmacopœias.—Official in Dan., Dutch, Fr., Hung., Ital., Mex., Port., Russ., Span., Swed., Swiss and U.S. Not in the others.

Tests.—Codeine possesses a melting point of 156° C. (312·8° F.), the *B.P.* does not give a melting point; the *U.S.P.* gives 154·9° C. (310·8° F.); *Fr. Codex* (1908) 155° C. (311° F.) The aqueous solution of the alkaloid is alkaline towards Litmus paper and is lævogyrate. Pure Sulphuric Acid yields no coloration with Codeine in the cold, but on warming a blue coloration is slowly produced; the blue coloration is immediately produced if a trace of Ferric Chloride, Ammonium Molybdate Solution, or Potassium Ferricyanide is present. The *B.P.* adds that on the addition of a minute trace of Diluted Nitric Acid the colour changes to a bright scarlet, becoming orange. Codeine is distinguished from Morphine by the following tests:—When moistened with Nitric Acid the liquid becomes yellow, but not red. A 1 in 50 solution of Codeine in Water, acidulated with Hydrochloric Acid, yields with Potassium Hydroxide Solution a whitish precipitate, but is not precipitated by the addition of Ammonia Solution. A saturated aqueous solution acidulated with Hydrochloric Acid should yield on the addition of Ferric Chloride Test-solution and a very dilute Potassium Ferricyanide solution only gradually a dirty green, but no blue coloration. The *B.P.* wording of the latter test has been subjected to criticism (*P.J.* '00, ii. 149). As the text reads a neutral solution of Codeine Hydrochloride would be used in making this test, which would obviously be quite different in its character from the solution employed if a comma were placed after the word Water, so as to read: 'A saturated solution of Codeine in Water, acidulated with Hydrochloric Acid.' Exception is taken in the same reference to the *B.P.* statement that the test shows the absence of Morphine and other impurities. This is considered too broad as it will by no means detect all other impurities nor even any considerable proportion of possible impurities.

0·1 gramme when heated to redness with free access of air leaves no weighable residue.

Codeine is not official in the *P.G.*

Colour Reactions.—The following colour reactions are given in the *B.P.* and *U.S.P.*: Sulphuric Acid dissolves the alkaloid without coloration, *B.P.*, either without coloration or producing a slight pinkish tint which disappears within two minutes, but on heating a violet colour is developed. (The presence of nitrous compounds causes a pink colour in the cold), *U.S.P.* The solution of Codeine in Sulphuric Acid gives a blue or bluish-black colour with (*a*) 2 drops of T.S. of Ammonium Molybdate, (*b*) a trace of Ferric Chloride, (*c*) or Potassium Ferricyanide; the addition of a minute trace of Diluted Nitric Acid changes this colour to a bright scarlet, becoming orange, *B.P.* Codeine yields with Sulphuric Acid and (*a*) a trace of Ferric Chloride, a violet-blue coloration; (*b*) a drop of Nitric Acid, a blood-red coloration; (*c*) a trace of Selenious Acid, a green coloration; (*d*) a drop of T.S. of Formaldehyde (added to the Codeine and Sulphuric Acid previously mixed), a violet-blue coloration, *U.S.P.* A mixture of Codeine and Nitric Acid yields a yellow coloration, but should not be red, *B.P.*; the *U.S.P.* states that if 0·05 gramme of Codeine be sprinkled upon 2 c.c. of Nitric Acid (sp. gr. 1·200) the crystals will turn red, but the acid will only acquire a yellow colour (difference from and absence of Morphine). A solution of 0·03 gramme of Codeine in 2 c.c. of Sulphuric Acid yields with 1 drop of a diluted Nitric Acid Solution (1 drop of Acid in 200 c.c. of Water), a bluish-red tint, gradually changing to blue, *U.S.P.* There should not be any blue colour developed, but only slowly a dull green on the addition of T.S. of Ferric Chloride and a very dilute solution of Potassium Ferricyanide to a saturated solution of Codeine in Water acidulated with Hydrochloric Acid, *B.P.* In the *U.S.P.* test quantities are given: a small crystal of Potassium Ferricyanide is dissolved in 10 c.c. of Water, and to this is added 1 drop of T.S. of Ferric Chloride and 1 c.c. of a 1 p.c. solution of Codeine, when no blue colour should be developed at once.

CODEINÆ PHOSPHAS. Codeine Phosphate.

This crystalline product $(\mathbf{C_{18}H_{21}NO_3, H_3PO_4})_2$, $\mathbf{3H_2O}$, eq. 842·20, is the most soluble salt of Codeine.

Fine white acicular crystals, or as a white odourless crystalline powder possessing a bitter taste and feebly acid reaction.

Solubility.—1 in 4 of Water; 1 in 200 of Alcohol (90 p.c.).

Dose.—¼ to 2 grains = 0·016 to 0·13 gramme.

Ph. Ger. maximum single dose, 0·1 gramme; maximum daily dose, 0·3 gramme.

Foreign Pharmacopœias.—Official in Belg., Dan., Fr., Ger., Jap., Norw., Russ., Swed., Swiss and U.S.

Tests.—Codeine Phosphate should answer the tests distinctive of Codeine given in the large type under the heading of Codeina. It melts at a temperature of about 235° C. (455° F.). The aqueous solution yields on the addition of Silver Ammonio-nitrate Solution a light yellow precipitate readily soluble in Ammonia Solution and in cold dilute Nitric Acid; with Magnesium Ammonio-sulphate Solution it affords a white crystalline precipitate; with Ammonium Molybdate containing Nitric Acid, it yields on warming a yellow precipitate, which is soluble in Ammonia and which is reprecipitated as a white crystalline precipitate on the addition of Magnesium Ammonio-sulphate. The reaction of a 5 p.c. aqueous solution towards Litmus paper is slightly acid. This solution yields with Potassium Hydroxide Solution a whitish precipitate, but no precipitate on the addition of Ammonia Solution.

Codeine Phosphate of the *B.P.* contains theoretically 70·52 p.c. of Codeine, that of the *U.S.P.* 69·05 p.c. The *B.P.* gives no process for quantitatively determining the amount of alkaloid present; the *U.S.P.* requires that a weighed quantity of 0·2 gramme of the salt when precipitated with Potassium Hydroxide Solution and shaken out with Chloroform should yield not less than 0·13 gramme of Codeine, corresponding to not less than 65·0 p.c. of alkaloid.

The more generally occurring impurities are excess of moisture, Chlorides, Sulphates, Morphine and mineral matter. The formula given for the salt in the *B.P.* shows $1\frac{1}{2}H_2O$, whilst that of the *U.S.P.* and the *Fr. Codex* (1908), indicates $2H_2O$. All three Pharmacopœias state that at 100° C. (212° F.) it loses all of its Water of crystallisation. The *B.P.* formula $1\frac{1}{2}H_2O$ would indicate a loss of 6·36 p.c. of Water; the *U.S.P.* and *Fr. Codex* a loss of 8·31 p.c.; the *P.G.* mentions that at 100° C. (212° F.) the salt loses 8 p.c. in weight. The aqueous solution when acidified with diluted Nitric Acid should yield no opalescence or precipitate with Silver Nitrate Solution or with Barium Chloride Solution, indicating the absence of Chlorides and Sulphates. The presence of Morphine is indicated by Ferric

Chloride Test-solution which would yield a blue coloration. The *U.S.P.* and *Fr. Codex* employ a mixture of Potassium Ferricyanide Solution and Ferric Chloride Test-solution as a test for Morphine.

0·1 gramme of the salt leaves no weighable residue when ignited with free access of air.

Colour Reactions.—0·01 gramme of Codeine Phosphate gives with 10 c.c. of Sulphuric Acid a colourless solution, *B.P.*; the *U.S.P.* states that the acid produces either no colour or a slight pinkish tint which disappears in 2 minutes. Codeine Phosphate gives with Sulphuric Acid containing (*a*) a trace of Ferric Chloride (1 drop of T.S. of Ferric Chloride in 10 c.c., *P.G.*) a violet-blue colour, *P.G.* and *U.S.P.*; (*b*) a trace of Selenious Acid, a green colour changing rapidly to blue and then slowly back to grass-green (Morphine gives a blue colour changing to green and then to brown), *U.S.P.*; (*c*) a drop of T.S. of Formaldehyde, a violet-blue colour (Morphine gives an intense purple), *U.S.P.* The solution of a small crystal of Potassium Ferricyanide in 10 c.c. of Water with the addition of a drop of T.S. of Ferric Chloride should not immediately assume a blue colour when mixed with 1 c.c. of a 1 p.c. Solution of Codeine Phosphate, *P.G.* and *U.S.P.* No blue colour should be developed with Codeine Phosphate and T.S. of Ferric Chloride, *B.P.*

Codeinæ Hydrochloridum is official in Austr., Dutch and Mex. It is crystalline and soluble in Water. **Codeinæ Salicylas** is also crystalline, and readily soluble in Alcohol and Ether, but only slightly soluble in Water. **Codeinæ Sulphas** is official in U.S. Doses same as Phosphate.

Preparation.

SYRUPUS CODEINÆ. Syrup of Codeine.

Codeine Phosphate, 40 grains; Distilled Water, ¼ fl. oz.; Syrup, 19¾ fl. oz. (1 grain in 240 minims)

B.P. directs the Codeine Phosphate to be dissolved in the Distilled Water, but 40 grains of Codeine Phosphate will not dissolve in ¼ fl. oz. Distilled Water: it is better to use 180 minims.

Dose.—½ to 2 fl. drm. = 1·8 to 7·1 c.c., containing ⅛ to ½ grain Codeine Phosphate.

It is 50 p.c. stronger than the Syrup described in previous editions of the *Companion.*

Foreign Pharmacopœias.—Official in Belg., 3 in 1000; Fr., Ital., Mex. and Swiss, 1 in 500; Span., 1 in 600. Made with the Alkaloid. Dutch, 1 of Hydrochloride in 400.

Not Official.

CODEINE PASTILS.—Contain ⅛ grain = 0·008 gramme of Codeine in each. One for a dose when the cough is troublesome.

An improvement on Codeine Jelly.

Official in Ital., $\frac{1}{13}$ grain = 0·005 gramme in each.

LINCTUS CODEINÆ.—Syrup of Codeine, 20 minims; Glycerin, 20 minims; Lemon Juice, 18 minims; Chloric Ether, 2 minims.—*Brompton.*

Syrup of Codeine, 30 minims; Citric Acid, 1 grain; Emulsion of Chloroform, 3 minims; Glycerin, 10 minims; Mucilage of Tragacanth, to 1 fl. drm.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

Syrup of Codeine, ½ fl. drm.; Syrup of Virginian Prune, ½ fl. drm.—*Guy's.*

PILULA CODEINÆ COMPOSITA.—Codeine, ½ grain; Kaolin, ½ grain; Extract of Cascara, 2 grains; Hard Soap, to 4 grains.—*Guy's.*

CODEINÆ IODAS.—A combination of Iodic Acid with the alkaloid. Has been introduced as an analgesic.

Dose.—½ grain = 0·032 gramme by hypodermic injection.

Apocodeina.—Produced by heating Codeine with Zinc Chloride; it forms brown amorphous resinous masses.

Apocodeinæ Hydrochloridum is supplied as a brown, amorphous powder, soluble in Water. Dott doubts the existence of Apocodeine, and states that the commercial products sold under this name are not of a very definite nature.

It has been used by subcutaneous injection in 30-minim doses of a 1 p.c. solution to produce increased peristalsis of the bowel, and has also been used internally as an expectorant in bronchial affections and as a sedative in mental disturbance, in doses of 0·02 to 0·06 gramme (⅓ to 1 grain).

A suitable combination for the internal administration is Apocodeine Hydrochloride, 0·5 gramme; Syrup of Raspberry, 25 grammes; Distilled Water, 100 grammes; in doses of ½ to 1 fl. drm. = 1·8 to 3·6 c.c.

This salt, which has been frequently referred to in medical literature, is again mentioned (*L.* '06, i. 1191) as a laxative. It may be administered in doses of 2 c.c. of a 3 p.c. solution.

COLCHICUM.

Fr., Colchique; Ger., Zeitlosenknollen; Ital., Bulbo de Colchico; Span., Bulbo de Colquico.

The fresh Corm of *Colchicum autumnale*, as well as the dried, ripe Seeds, are official.

The use of Colchicum Seeds only, was agreed by the Brussels International Congress.

Medicinal Properties.—It is a specific in gout, especially the acute form, controlling the pain and inflammation, and cutting short the attack. Useful in the headache, dyspepsia, eczema, conjunctivitis, and other conditions which occur in gouty subjects. May be combined with other cholagogues, or given with saline purgatives in cases of hepatic congestion in gouty patients. It may produce gastric or intestinal irritation, even in ordinary doses, and should then be discontinued for a time. The Extract is frequently prescribed with Dover's Powder to relieve painful gout.

Dose.—Of the dried Corm, 2 to 5 grains = 0·13 to 0·32 gramme, but usually given in the form of Extract or Wine.

Incompatibles.—Tincture of Iodine, Guaiacum, and vegetable astringents.

Official Preparations.—Extractum Colchici and Vinum Colchici from the **Corm,** Tinctura Colchici Seminum from the **Seeds.**

Not Official.—Extractum Colchici Aceticum, Extractum Colchici Cormi, Fluidextractum Colchici Seminis, Mistura Colchici, Pilulæ Colchici et Hydrargyri, Tinctura Colchici Composita, Tinctura Colchici Florum, Vinum Colchici Seminum, Colchicina, and Colchicinæ Salicylas.

Antidotes.—In case of poisoning with Colchicum, emetics, Tannic Acid, demulcent drinks, and, if coma be present, Brandy, Ammonia, Coffee, and other powerful stimulants may be given. Hypodermic injection of ⅙ grain of Morphine.

COLCHICI CORMUS. Colchicum Corm.

The fresh Corm of *Colchicum autumnale*, collected in early summer; also the Corm, dried at a temperature not exceeding 65·5° C. (150° F.), after being stripped of its coats and transversely sliced, Colchicum Corms contain about 0·5 p.c. of Colchicine, but the *B.P.* makes no requirement that they shall contain a definite percentage of alkaloid; the *U.S.P.* requires that they shall yield not less than 0·35 p.c. of Colchicine, and indicates a method of determination.

Foreign Pharmacopœias.—Official in Mex., Port. and U.S. Not in the others.

Larger equivalent doses of the corm than of the wine or tincture can be given without undesirable effects, and the powdered corm is stated to give better results in acute gout.—*B.M.J.* '04, ii. 1460.

Descriptive Notes.—It should be noted that the extract is prepared from the fresh corm collected in early summer. *Colchicum autumnale*, L., is a very local plant in this country, and there is therefore some difficulty in obtaining the fresh corm. The best period is in July when the leaves have turned yellow or in August when the plant is in flower, as the corm is then in mature condition. According to Schroff's experiments the corms are best dried entire in sun and air, and preserved; they lose none of their activity even if kept several years (*Pharmacographia*). Although the fresh corm is, according to the *B.P.* an inch broad (25 mm.) and an inch and a half long (35 mm.) it is often larger if obtained from full grown plants, and even the dried corm in slices may exceed an inch in diameter and $\frac{1}{10}$ to $\frac{1}{8}$ in thickness (2 or 3 mm.). The reniform shape is characteristic, for although the corms of some Fritillaries and the Hermodactyls of the East have the same shape they are not met with in Western commerce. Under the microscope the compound starch grains (0·1 to 0·15 mm., *Planchon* and *Collin*), usually three or four, each with a stellate hilum, and without striæ, and the irregular epidermal cells with pitted walls, are sufficiently characteristic. According to Vogl the cambium tissue contains a yellowish amorphous substance which, when a section of the corm is treated with concentrated Sulphuric Acid, colours the cellulose tissue gamboge yellow and the vessels orange red. The dried corm if long kept and especially if allowed to become damp loses its medicinal effect to a certain extent.

Tests.—The *U.S.P.* process of determination is essentially as follows:—A weighed quantity of 10 grammes is macerated for twelve hours, with frequent intervals of shaking (or for four hours if a mechanical shaker be employed), in an Erlenmeyer flask with 100 c.c. of a mixture of 77 c.c. of Ether, 25 c.c. of Chloroform, 8 c.c. of Alcohol (94·9 p.c.), and 3 c.c. of Ammonia Water. The liquid is filtered, and 50 c.c. of the filtrate is evaporated to dryness at a gentle heat; the residue is dissolved in 10 c.c. of Ether, 5 c.c. of Water added, the mixture well stirred and the Ether evaporated. When cool the aqueous solution is filtered into a small separator, the insoluble matter being kept as much as possible in the beaker or dish. The residue is redissolved in Ether, 5 c.c. of Water added, the Ether evaporated as previously. The beaker or dish and the filter are washed with a little Water, and the combined aqueous solutions are well shaken with 15 c.c. of Chloroform. After separation of the chloroformic liquid, the aqueous portion is shaken with three successive portions of 10 c.c. each of Chloroform, the chloroformic layer being separated in each case, mixed with the first Chloroform shaking, and the mixed chloroformic liquids evaporated to dryness. The residue is dissolved in a little Alcohol (94·9 p.c.), the Alcohol evaporated, the residue dissolved in 5 c.c. of Ether, 5 c.c. of Water added, and the mixture stirred for a few seconds. The Ether is evaporated, the aqueous liquid filtered through a wet filter paper into a separator, the vessel and filter washed with 5 c.c. of Water, the washings being added to the contents of the separator. The aqueous liquid is shaken out with 15 c.c. of Chloroform, the Chloroform transferred after complete separation to a tared flask, the aqueous portion extracted with three successive portions each of 10 c.c. of Chloroform, which are separated as previously and transferred to the tared flask containing the first shaking. The Chloroform is completely removed by evaporation, the residue is dissolved in Alcohol (94·9 p.c.), which is in turn evaporated, and the residue is dried at 100° C. (212° F.) until constant. If this weight be multiplied by 20 it indicates the p.c. of Colchicine present in the Corms.

Preparations.

EXTRACTUM COLCHICI. Extract of Colchicum.

A soft extract prepared from the juice of fresh Colchicum Corms which have been deprived of their coats. The clarified juice is heated to 100° C. (212° F.) to coagulate Albumen, and the strained liquid is evaporated to a soft extract at a temperature not exceeding 71·1° C. (160° F.).

100 lb. of Corms yield about 4 lb. of Extract.

The *B.P.* Extract is not a standardised preparation and no process of determination appears in the *Pharmacopœia.* The Extract official in the *U.S.P.* is standardised to contain 1·4 p.c. of Colchicine. The *P.G.* does not contain an Extract of Colchicum Corms.

Dose.—¼ to 1 grain = 0·016 to 0·06 gramme.

Foreign Pharmacopœias.—Official in Belg., Fr., Ital., Mex. and Span. (Alcoholic Extract of Seeds); Mex. (Alcoholic from Corms), also (Fluid Extract of Corms and Seeds); Port. and U.S. Extract from Corms with Acetic Acid. U.S. has Fluid Extract of Seeds. Not in the others.

Tests.—The *U.S.P.* method for the determination of Colchicine in Colchicum Extract is essentially as follows :— A weighed quantity of 4 grammes of the extract is dissolved in 20 c.c. of Water, transferred to a 100 c.c. flask and sufficient Alcohol (94·9 p.c.) added to bring the volume of the liquid to 100 c.c. After the contents of the flask have been well shaken, they are allowed to stand 5 minutes, filtered, and 50 c.c. of the filtrate collected, evaporated to dryness in a porcelain dish, 10 c.c. of Ether and 5 c.c. of Water are added to the residue, and the Ether removed by evaporation. When cool, the aqueous solution is filtered into a separator, the insoluble matter being retained as far as possible in the vessel used for the evaporation. The residue remaining in this vessel is again treated with 10 c.c. of Ether and 5 c.c. of Water, the Ether being removed as previously. The dish and filter are rinsed with a little Water, and the mixed aqueous liquids collected in a separator. After rendering the liquid alkaline by the addition of a sufficiency of Ammonia Solution, the Colchicine is extracted by successive quantities of 20, 15 and 10 c.c. of Chloroform respectively. The separated chloroformic solutions are mixed and evaporated to dryness, and the residue is mixed with two successive small quantities of Alcohol (94·9 p.c.), the latter being removed in each case by evaporation. 5 c.c. of Water and 10 c.c. of Ether are added to the residue, the liquid shaken and the Ether evaporated. When cool, the aqueous liquid is filtered into a separator, the flask and filter being rinsed with Water. The Colchicine is extracted by successive shakings with 20 c.c., 15 c.c. and 10 c.c. of Chloroform. The separated chloroformic liquids are mixed, transferred to a tared flask, evaporated to dryness, the residue dissolved in 2 small successive quantities of Alcohol (94·9 p.c.), the latter removed by evaporation and the residue dried till constant at 100° C. (212° F.). The weight multiplied by 50 shows the p.c. of Colchicine present in the Corm Extract.

VINUM COLCHICI. Colchicum Wine.

4 of Colchicum Corm in No. 20 powder, macerated in 20 of Sherry. (1 in 5)

Dose.—10 to 30 minims = 0·6 to 1·8 c.c.

Diluted Acetic Acid appears to be about as good a solvent as Sherry, but Alcohol (45 p.c.) was better than either.—*P.J.* '97, i. 173. Further notes on the same.—*P.J.* '98, i. 131.

Foreign Pharmacopœias.—Official in Port., 1 and 10 Madeira; Mex., 1 in 10 Sherry. *See* also Vinum Colchici Seminum.

Tests.—Colchicum Wine possesses a specific gravity of about 1·013; contains about 8·5 p.c. w/v of total solids and about 20 p.c. w/v of Absolute Alcohol.

The Wine official in the *U.S.P.* is prepared with a standardised fluid extract made from Colchicum Seeds, and should contain 0·04 p.c. w/v of Colchicine.

COLCHICI SEMINA. Colchicum Seeds.

Fr., Semence de Colchique; Ger., Zeitlosensamen; Ital., Semi di Colchico; Span., Semilla de Colquico.

The dried ripe seeds of *Colchicum autumnale*, L.

The Seeds are official in *B.P.*, *U.S.P.* and *P.G.* They usually contain 0·6 to 1·0 p.c. of Colchicine, but neither the *B.P.* nor the *P.G.* requires them to yield a definite percentage of alkaloid nor includes a method of determination. The *U.S.P.* requires that they shall yield not less than 0·45 p.c. of Colchicine.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Span., Swed., Swiss and U.S.

The *Brussels Conference* recommends only the Colchicum seed.

Descriptive Notes.—Colchicum seeds are pale brown and inodorous when freshly gathered, but become darker in drying and exude a saccharine matter consisting of Glucose. The percentage of this varies, and must be taken into consideration in estimating the extractive of galenical preparations made with them. The seeds are extremely hard and tough and difficult to powder. They have a bitter acrid taste, and are nearly spherical, about $\frac{1}{12}$ to $\frac{1}{8}$ inch (2 to 3 mm.) in diameter, but pointed by a strophiole appendage at the hilum. The diameter given in *B.P.* is 2·5 mm., *U.S.P.* 2 mm., *P.G.* 3 mm. The seeds ripen in June.

Tests.—The method of determination recommended by the *U.S.P.* is essentially as follows:—A weighed quantity of 10 grammes is macerated, with frequent intervals of shaking, for 12 hours (or for 4 if a mechanical agitator is employed), in an Erlenmeyer flask, with 100 c.c. of a mixture of 77 c.c. of Ether, 25 c.c. of Chloroform and 8 c.c. of Alcohol (94·9 p.c.), and 3 c.c. of Ammonia Solution. A measured quantity of 50 c.c. of the filtered liquid is transferred to a beaker or dish and evaporated nearly to dryness. The residue is dissolved in 10 c.c. of Ether, 5 c.c. of Water added, the mixture stirred well, and the Ether evaporated. When cool the aqueous liquid is filtered into a separator, the insoluble matter being retained as largely as possible in the beaker. This residue is redissolved in Ether, and after the addition of 5 c.c. of Water, the previous operation is repeated. The beaker and filter are washed with a little Water and the Colchicine extracted from the mixed aqueous liquids by agitation with 15 c.c. of Chloroform. The agitation is thrice repeated with successive quantities each of 10 c.c. of Chloroform. The chloroformic liquids are separated, transferred to a tared flask, the Chloroform completely removed by evaporation, the residue twice dissolved in small successive quantities of Alcohol (94·9 p.c.), the latter being in each case removed by evaporation, and the residue finally dried at a temperature of 100° C. (212° F.) till constant in weight. This weight multiplied by 20 gives the percentage of Colchicine present in the seeds. The ash of Colchicum Seeds should not exceed 6·0 p.c.

The *U.S.P.* has a 1 in 1 Fluid Extract prepared with Colchicum Seeds and standardised to contain 0·4 p.c. w/v of Colchicine.

Preparation.

TINCTURA COLCHICI SEMINUM. TINCTURE OF COLCHICUM SEEDS.

1 of Colchicum Seeds, in No. 30 powder, percolated with Alcohol (45 p.c.), to yield 5. (1 in 5)

B.P. 1885 was 1 in 8, altered in *B.P.* 1898 to 1 in 5; *see* also Foreign Pharmacopœias given below.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Ph. Ger. maximum single dose, 2·0 grammes; maximum daily dose, 6·0 grammes.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Jap., Span. and Swiss, 1 in 10; Hung., 1 in 5; Ger., Ital. and Swed., 1 and 10; U.S., 1 in 10; all from Seeds. Mex., 1 in 5 with Corms. Port., 1 in 5 with Seeds and Corms. All by weight except U.S. Not in the others.

The *Brussels Conference* recommended a strength of 10 p.c. of the Seeds with Alcohol (70 p.c.). Belg., Dan., Fr. and Swiss adopt the *B.C.* Standard.

Tests.—Tincture of Colchicum Seeds possesses a specific gravity of from 0·950 to 0·955; contains from 1 to 3 p.c. w/v of total solids and about 43 p.c. w/v of Absolute Alcohol. The Tincture official in the *B.P.* is not a standardised preparation, and consequently no process is given for the quantitative determination of the Colchicine.

The *U.S.P.* Tincture is required to contain 0·04 p.c. w/v of Colchicine. A measured quantity of 100 c.c. is evaporated on a water-bath to about a tenth of its volume. Sufficient Alcohol (94·9 p.c.) is added to redissolve any separated matter, 1 c.c. of Ammonia Solution added, and the Colchicine removed by shaking three times in succession with separate portions of 15 c.c., 15 c.c. and 10 c.c. of Chloroform. The Chloroform solutions are separated, mixed and evaporated nearly to dryness. The residue is dissolved in 10 c.c. of Ether, and 5 c.c. of Water added, the mixture well stirred, and the Ether removed by evaporation. When cool the aqueous solution is filtered into a small separator, the insoluble matter being retained as far as possible in the beaker. This residue is redissolved in a little Ether, 5 c.c. of Water added, the process repeated as previously. The beaker and filter are washed with a little Water, and the alkaloid is extracted from the aqueous solution by agitation, first with 15 c.c., and thrice subsequently with successive quantities of 10 c.c. each of Chloroform. The chloroformic liquids are separated in each case, transferred to a tared flask, the Chloroform removed completely by evaporation, the residue twice dissolved in a little Alcohol (94·9 p.c.), the latter being in each instance removed by evaporation, and the residue ultimately dried at a temperature of 100° C. (212° F.) till constant in weight. This weight will represent the percentage w/v of Colchicine present in the Tincture.

Not Official.

EXTRACTUM COLCHICI ACETICUM (*B.P.* 1885).—Crushed fresh Corms, previously peeled, 112; Acetic Acid, 6; stir together, press, and after subsidence heat the clear liquor to 212° F. (100° C.), strain through flannel, and evaporate at 160° F. (71·1° C.) to a soft extract.

100 lb. of Corms yield about 5 lb. of Extract.

Dose.—½ to 2 grains, in pill, with an equal weight of Liquorice Powder.

EXTRACTUM COLCHICI CORMI (*U.S.*).—1000 grammes of Colchicum Corms in No. 60 powder is percolated with 350 c.c. of Acetic Acid (36 p.c.) mixed with 1500 c.c. of Water, and the percolation completed with Water; the liquor is evaporated at a temperature not exceeding 80° C. (176° F.) in a porcelain vessel to a pilular consistence. It is adjusted to a strength of 1·4 p.c. of Colchicine by means of Sugar of Milk.

FLUIDEXTRACTUM COLCHICI SEMINIS.—About a 1 in 1 Fluid Extract prepared from Colchicum Seeds, and a mixture of Alcohol (95 p.c.) 2 parts and Water 1 part. It is standardised to contain 0·4 p.c. of Colchicine.—*U.S.P.*

MISTURA COLCHICI.—Colchicum Wine, 15 minims; Potassium Bicarbonate, 20 grains; Magnesium Sulphate, 15 grains; Peppermint Water, to 1 fl. oz.—*St. Thomas's.*

The *B.P.C.* formula is the same, except in using Magnesium Carbonate, 10 grains, in place of Potassium Bicarbonate, 20 grains.

Colchicum Wine, 15 minims; Carbonate of Magnesia, 10 grains; Bicarbonate of Potassium, 15 grains; Peppermint Water, to 1 fl. oz.—*Royal Free.*

PILULÆ COLCHICI ET HYDRARGYRI.—Acetic Extract of Colchicum, ¼ grain; Mercury Pill Mass, ⅓ grain; Compound Extract of Colocynth, ½ grain; to make one pill.—*B.P.C.*

Sir Benjamin Brodie's Gout Pills.—Compound Extract of Colocynth, 16 grains; Extract of Rhubarb, 16 grains; Mercury Pill, 16 grains; Acetic Extract of Colchicum, 6 grains; divided in 12 pills.—*Pharm. Form.*

This has been incorporated in the *B.P.C.* under the title Pilulæ Colchici et Hydrargyri Compositæ.

TINCTURA COLCHICI COMPOSITA (*Ph. Lond.*).—1 of bruised Colchicum Seeds, macerated with 8 of Aromatic Spirit of Ammonia.

Dose.—15 to 30 minims = 0·9 to 1·8 c.c.

This has been incorporated in the *B.P.C.*

TINCTURA COLCHICI FLORUM (*Squire*).—Fresh Flowers, 2; Alcohol (90 p.c.), by weight, 1; after seven days, filter.

B.P.C. has incorporated this preparation, but employs Alcohol (70 p.c.) by volume in place of Alcohol (90 p.c.) by weight.

Dose.—10 to 30 minims = 0·6 to 1·8 c.c. This preparation closely resembles the Eau Médicinale.

Tests.—Tincture of Colchicum Flowers possesses a specific gravity of about 0·970; contains about 4 p.c. w/v of total solids and about 39 p.c. w/v of Absolute Alcohol. It is standardised to contain 0·06 p.c. of Colchicine.

VINUM COLCHICI SEMINUM.—1 of Colchicum Seeds, in fine powder, macerated with 10 of Sherry.

Dose.—10 to 30 minims = 0·6 to 1·8 c.c.

Ph. Ger. maximum single dose, 2 grammes; maximum daily dose, 6 grammes.

B.P.C. same strength as above, but with Detannated Sherry.

Foreign Pharmacopœias.—Official in Dutch, 1 and 10 Malaga and Spirit; Hung., 1 in 5 Malaga; Ger., Jap. and Norw., 1 and 10 Sherry; Ital., 1 and 10 Marsala; Port., 1 and 10 Madeira; U.S., Fluid Extract, 1 in 10, with White Wine and Alcohol. All by weight except U.S.

COLCHICINA. Colchicine $C_{22}H_{25}NO_6$, eq. 396·24.—A yellowish powder, soluble in Water and Alcohol (90 p.c.).

Dose.—$\frac{1}{120}$ to $\frac{1}{32}$ grain = 0·00054 to 0·002 gramme.

Colchicein is Tri-methyl-acetyl-colchicinic Acid, and crystallises in shining white needles. **Colchicine** is the Methyl Ester of Colchicein.

Colchicine has been shown (*B.M.J.* '04, ii. 1697; *L.* '04, ii. 1784) to be a slow poison, acting on the medulla, which it paralyses.

A solution of $\frac{1}{250}$ grain in Methyl Salicylate enclosed in Gelatin **capsule** is known under the name of '**Colchisal.**'

Foreign Pharmacopœias.—Official in Fr., Hung., Mex. and U.S.

Tests.—Colchicine melts at 143° to 147° C. (289·4° to 296·6° F.). *Fr. Codex* gives 145° C. (293° F.). It is neutral in reaction towards Litmus. Its aqueous solution is lævogyrate. Its solution in dilute mineral acid or alkali gradually becomes intensely yellow. Concentrated Nitric Acid produces a violet-blue, the colour changing to yellow, and ultimately to green; on dilution with Water the violet solution changes to yellow, and on the addition of Sodium Hydroxide Solution in excess, to a fine orange or red colour; with very minute quantities of Colchicine the colour produced is rose-red. In concentrated Sulphuric Acid the alkaloid dissolves with the production of an intense yellow colour, which changes to a greenish-blue on the addition of Nitric Acid, then to red, and finally to yellow. An aqueous solution gives no immediate coloration with Ferric Chloride Test Solution, but on warming a greenish coloration is produced; an alcoholic solution gives a garnet-red coloration. Colchicine is stated to form a compound with Chloroform which is readily decomposed by Water. *Fr. Codex* gives the formula of this compound as $C_{22}H_{25}NO_6 \cdot 2CHCl_3$. The absence of Chloroform may be ensured by mixing 0·1 gramme of the alkaloid with 0·3 gramme of Calcium Carbonate (free from Chlorides), moistening with Water, evaporating to dryness, and igniting. The residue is dissolved in dilute Nitric Acid, filtered, and Silver Nitrate Solution added; no turbidity or precipitate should be produced.

0·1 gramme of Colchicine should leave no weighable residue when ignited with free access of air.

COLCHICINÆ SALICYLAS.—Yellow, amorphous powder, soluble in Water, in Alcohol (90 p.c.), and in Ether. It dissolves 1 in 100 of Methyl Salicylate. It should be preserved in well-closed bottles of a dark amber tint. Has been recommended in the treatment of gout and rheumatism as combining the properties of its two constituents.

Dose.—$\frac{1}{120}$ to $\frac{1}{32}$ grain = 0·00054 to 0·002 gramme.

Tests.—Colchicine Salicylate yields the reactions distinctive of Colchicine given under that heading.

An aqueous solution of the salt yields a violet coloration with Ferric Chloride Test Solution. The salt should leave no weighable residue when ignited with free access of air.

Not Official.

COLLINSONIA.

The Root of *Collinsonia Canadensis, L.* (Stone Root).

Various preparations of this have been recommended in acute cystitis, and in the treatment of renal calculi.—*B.M.J.* '87, ii. 712; *L.* '88, i. 868.

Dose.—15 to 60 grains = 1 to 4 grammes.

TINCTURA COLLINSONIÆ.—Collinsonia Root, 1; Alcohol (60 p.c.), 10.

Dose.—30 to 120 minims = 1·8 to 7·1 c.c.
This has been incorporated in the *B.P.C.*

A 1 in 1 **Fluid Extract** is also made.

Dose.—15 to 60 minims = 0·9 to 3·6 c.c.

COLOCYNTHIDIS PULPA.

COLOCYNTH PULP.

FR., COLOQUINTE; GER., KOLOQUINTHEN; ITAL., COLOQUINTIDE;
SPAN., COLOQUINTIDA.

The dried pulp of the Fruit of *Citrullus Colocynthis*, Schrader, freed from Seeds. The fruit is imported chiefly from Smyrna, Trieste, France and Spain.

Medicinal Properties.—It is a powerful drastic, hydragogue cathartic, dangerous in large doses. It should not be prescribed alone; but in combination it is very commonly prescribed as an aperient in the form of Compound Extract or Pill, and combined with Henbane, which prevents griping. It is not to be given in pregnancy, nor when gastric or intestinal inflammation is suspected. The Tincture is ordered in Mixtures.

Dose.—2 to 8 grains = 0·13 to 0·52 gramme.

Ph. Ger. maximum single dose, 0·3 gramme; maximum daily dose, 1 gramme.

Official Preparations.—Extractum Colocynthidis Compositum and Pilula Colocynthidis Composita; Pilula Colocynthidis Composita is used in the preparation of Pilula Colocynthidis et Hyoscyami.

Not Official.—Pilulæ Catharticæ Compositæ, Pilulæ Catharticæ Vegetabiles, Pilulæ Colocynthidis et Hydrargyri, Tinctura Colocynthidis.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr. (Coloquinte), Ger., Hung., Ital. (Coloquintide), Jap., Norw., Port. (Coloquintidas), Russ, Mex. (Coloquintida), Swed., Swiss and U.S.

Descriptive Notes.—Colocynth fruits are imported from Asia Minor, Smyrna, Almeria in Spain, Mogador, Egypt and Cyprus, also from Persia, and more rarely from Marseilles and Trieste.

The kinds most frequently met with in commerce are the Turkish and Spanish, both of which have been peeled after drying, the Spanish less carefully, and shows more traces of the brown rind. The Mogador fruit is larger and unpeeled, it is brown externally when dry, though marbled with green and white when fresh; the Persian is peeled before drying, and consequently presents a shrunken appearance. It yields, however, the same proportion of pulp in relation to the seeds as the other varieties. Two forms of powdered Colocynth are sold, the one containing the seeds and the other freed from them as nearly as possible. The former is cheaper and is excluded by the Pharmacopœia direction 'freed from seeds,' and is used for keeping away moths from furs. The peeled fruit is alone official, occurring in more or less broken balls, about 2 in. (5 cm.) or less in diameter, *B.P.*; about 5 to 10 cm. in diameter, *U.S.P.* The Mogador variety exceeds the diameter given in *B.P.*, and is unpeeled and therefore excluded, whilst the Persian variety is not.

Tests.—The boiled and cooled aqueous decoction of the pulp should yield no distinctive blue coloration with Starch Solution. The official test also adds that 'only traces of fixed oil should be removed by Ether.' The author has pointed out in the *Companion* (17th Edition) that the removal of the Seeds commercially is carried out very imperfectly, and as the Seeds contain about 15 p.c. of Oil it is doubtful whether a single trade sample could be found which would pass the official Ether Test, even on the supposition that the Pulp itself was free from Ether-soluble constituents. The Pulp, however, perfectly free from Seeds yields to Ether about 3 p.c. of extractive of an oily nature, so that the official test should be completely modified. Confirmation of the above results appears (*Analyst*, xxvi. 31). Not merely Oil but also some gummy matter is extracted by Ether, both from the Seeds and the Pulp, and the use of a different solvent is therefore suggested. A limit for fixed Oil, as shown by extraction with Petroleum Spirit has been recommended; it should amount to from 1 to 2 p.c. The *B.P.* mentions that it yields, when dried at 100° C. (212° F.) and incinerated, at least 9·0 p.c. of ash. The author has found the ash of the Pulp to vary between 8·6 and 14 p.c., and that of the Seeds between 2·2 and 4·0 p.c.; on these figures Colocynth Pulp with an allowable 10 p.c. of Seeds would yield not less than 8 p.c. of ash. It should also be noted that the ash both of Pulp and Seed is very deliquescent. The figures given (*Analyst*, xxvi. 31) for the Pulp are from 7·8 to 12·1 p.c., for the Seeds 1·7 to 3·2 p.c. The hygroscopic nature of the ash is commented on and a determination of the sulphated ash suggested. A limit of 9·0 to 12·0 p.c. of ash has been recommended. No ash limit is suggested in either the *U.S.P.* or *P.G.*

Preparations.

EXTRACTUM COLOCYNTHIDIS COMPOSITUM. Compound Extract of Colocynth.

Colocynth Pulp, 6; Extract of Barbados Aloes, 12; Scammony Resin, 4; Curd Soap, in shavings, 4; Cardamom Seeds, in the finest powder, 1; Alcohol (60 p.c.), 160.

B.P. directs the Colocynth to be macerated in the Alcohol for four days; press out the Tincture; remove the Alcohol by distillation, and add the Extract of Aloes, Scammony Resin and Soap; evaporate to a firm extract, adding the Cardamoms towards the end of the process; but it is better to evaporate the Colocynth Extract to dryness, powder it, and mix with the other ingredients to form Pulv. Ext. Coloc. Co.; the product weighs about 24.

6 of Compound Extract is about equal to 1½ of Pulp (Simple Extract ½), Extract of Aloes 3, Resin of Scammony 1, Curd Soap 1, Cardamoms ¼, Water ½.

Dose.—2 to 8 grains = 0·13 to 0·52 gramme.

Ph. Ger. maximum single dose of the Simple Extract, 0·05 gramme; maximum daily dose, 0·15 gramme.

Commonly prescribed with Extract of Hyoscyamus, to prevent griping.

Foreign Pharmacopœias.—Official in Port., Colocynth 30, Aloes 55, Scammony 22, Hard Soap 15, Cardamoms 3; Swed., Colocynth 5, Aloes 10, Resin of Jalap 3, Cardamoms 1, Soap 2; Russ., Extract Colocynth 3, Aloes 10, Scammony 8, Extract of Rhubarb 5; U.S., Extract Colocynth 16, Purified Aloes 50, Resin Scammony 14, Cardamoms 6, Soap 14; all alcoholic. Not in the others. Austr., Belg., Dan., Dutch, Ger., Hung., Ital., Jap., Mex., Port., Russ., Swiss and U.S. have a Simple Extract made with Alcohol.

PILULA COLOCYNTHIDIS COMPOSITA. Compound Pill of Colocynth.

Colocynth Pulp, 1; Barbados Aloes, 2; Scammony Resin, 2; Potassium Sulphate, ¼; Oil of Cloves, ¼; Distilled Water, *q.s.* (about ¼). (about 1 in 6)

B.P. Dose.—4 to 8 grains = 0·26 to 0·52 gramme.

The *minimum* dose is somewhat high, as it is frequently prescribed in smaller doses. The same may be said of the next pill, which is only two-thirds of the strength.

For dispensing, keep the powders and oil ready mixed, and make up the mass as required with Water, or better still with Alcohol (60 p.c.).

This mass, when made with Scammony instead of Scammony Resin and divided into 5-grain pills, forms Gregory's pill.

Foreign Pharmacopœias.—Official in Norw., Colocynth 2, Aloes 4, Resin of Scammony 4, Oil of Cloves ⅔, Suet 3, Glycerin 3; Swed., Compound Extract of Colocynth 7, Cloves 1, Resin of Jalap 2, Extract of Wormwood *q.s.* Not in the others.

PILULA COLOCYNTHIDIS ET HYOSCYAMI. Pill of Colocynth and Hyoscyamus.

Compound Pill of Colocynth, 2; Extract of Hyoscyamus, 1.

B.P. Dose.—4 to 8 grains = 0·26 to 0·52 gramme.

Christison's Pill is 2 grains of Pilula Colocynthidis et Hyoscyami (*B.P.* 1867).

Hamilton's Pill.—For some years past it has been the general practice to supply 4 or 5 grains of the *B.P.* pill mass, but some few houses in Edinburgh still supply the pills of the late Dr. Hamilton, Jun., the formula for which was

Compound Extract of Colocynth, 2; Extract of Hyoscyamus, 1; mix and make into 3¾ grain pills.

Foreign Pharmacopœias.—Official in Jap., Colocynth 10, Aloes 20, Root of Jalap 20, Extract of Hyoscyamus 25, Potassium Sulphate 3, Oil of Cloves 1. Not in the others.

Not Official.

PILULÆ CATHARTICÆ COMPOSITÆ.—Compound Extract of Colocynth, 16 grains; Mild Mercurous Chloride, 12 grains; Resin of Jalap, 4 grains; Gamboge, 3 grains; made into a mass with Diluted Alcohol (49 per cent.) and divided into 12 pills.—*U.S.P.*

B.P.C. gives the same formula as above except that the *B.P.* Compound Extract of Colocynth is used in place of that of *U.S.P.*, which is different.

PILULÆ CATHARTICÆ VEGETABILES.—Compound Extract of Colocynth, 12 grains; Extract of Hyoscyamus, 6 grains; Resin of Jalap, 4 grains; Extract of Leptandra, 3 grains; Resin of Podophyllum, 3 grains; Oil of Peppermint, 2 minims, made into a mass with Diluted Alcohol (49 p.c.), and divide into 12 pills.—*U.S.P.*

PILULÆ COLOCYNTHIDIS ET HYDRARGYRI. *Syn.* Abernethy's Pills.—Mercury Pill, 3 grains; Compound Extract of Colocynth, 2 grains; in one pill.—*Pharm. Form.*

This appears also in *B.P.C.*, but the proportions are reversed.

TINCTURA COLOCYNTHIDIS.—1 of Colocynth Pulp, in coarse powder, macerated with 10 of Alcohol (90 p.c.). (1 in 10)

Dose.—10 to 15 minims = 0·6 to 0·9 c.c. three times a day.

Ph. Ger. maximum single dose, 1 gramme; maximum daily dose, 3·0 grammes.

This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in Hung. and Mex., 1 in 5; Belg., Jap. and Swiss, 1 in 10; Ger. and Ital., Fruits 1, Alcohol 10; Swed., 1 in 10 with Anise Fruits $\frac{1}{10}$. Not in the others.

Not Official.

CONDURANGO CORTEX.

The Bark obtained from *Gonolobus condurango.*

Medicinal Properties.—It was introduced as a remedy for cancer, but it has not fulfilled the expectations formed of it. It relieves catarrh and hyperæsthesia of the stomach, and has been used with benefit in ulcer and cancer of the stomach, relieving the vomiting, pain and hæmatemesis, and improving the appetite.—*L.M.R.* '88, 337; *L.* '95, i. 1004.

Descriptive Notes.—Formerly this bark was referred to *Gonolobus Condurango*, Triana, but in the *P.G.* it is now referred to *Marsdenia Condurango*, Reich. an Asclepiadaceous plant of Equatorial South America. It occurs in short quilled pieces, about 2 to 3 inches (50 to 75 mm.) long or more, ½ to ¾ inch (12 to 20 mm.) broad, and ⅛ inch (3 mm.) thick. Externally the bark is yellowish-grey, and the surface is uneven with slightly raised protuberances. The transverse fracture is yellowish-grey, and exhibits numerous small granular masses of stone cells, but towards the outer surface a few projecting fibres are noticeable. The distinctive features under the microscope are the single prismatic crystals in the phelloderm cells, the abundance of sphæraphides in the parenchyma, the very variable sclerenchymatous cells, and the abundance of starch. The medullary rays consist of a single row of cells as seen in transverse section, and laticiferous vessels are present.

A cold infusion of the bark (1–5) becomes cloudy when heated, but becomes clear again when cold (*P.G.*).

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Jap., Mex., Norw., Russ., Span., Swed. and Swiss. Not in the others.

EXTRACTUM CONDURANGO LIQUIDUM. A 1 in 1 fluid extract of Condurango bark prepared by percolation, with Alcohol (60 p.c.). The residue obtained after distilling the Alcohol from the latter portions of the percolate being dissolved in the reserved portion.—*B.P.C. Formulary* 1901, incorporated in the *B.P.C.*

Dose.—10 to 60 minims = 0·6 to 3·6 c.c.

100 of Condurango Bark is moistened with a mixture containing Alcohol (90 p.c.), 15; Distilled Water, 25; Glycerin, 10; and percolated with a mixture of Alcohol, 1; Distilled Water, 3; proceed as directed for fluid extracts, so as to produce 100.—*Dan.*, *Ger.* and *Jap.*

Austrian, Swedish, and Russian are similar; Dutch, Fluid extract, the bark is moistened with a mixture of Alcohol (90 p.c.) 60, Water 30, and Glycerin 10, and percolated with Alcohol (90 p.c.) 35 and Water 65; Belg., Fluid extract with Alcohol (30 p.c.); Solid extract with Alcohol (60 p.c); Fr., Fluid Extract with Alcohol (45 p.c.); Swiss, Fluid extract with a mixture of Alcohol (90 p.c.) 1 and Water 3; Spanish has an extract with Alcohol (70 p.c.).

VINUM CONDURANGO.—Fluid Extract of Condurango, 1; Malaga Wine, 9.—*Austr.* and *Swiss.*

Condurango Bark, 1; Malaga, 10.—*Dutch.*

Condurango Bark, 1; Sherry, 10.—*Ger.* and *Jap.*

Condurango Bark, 3; Alcohol (60 p.c), 3; Carinena or Alicante Wine, *q.s.* to yield 100.—*Span.*

All by weight.

Fluid Extract of Condurango, 1; Detannated Sherry, *q.s.* to make 10.—*B.P.C.*

Dose.—2 to 8 fl. drm. = 7·1 to 28·4 c.c.

CONIUM.

CONIUM.

FR., CIGUË; GER., SCHIERLING; ITAL., CICUTA; SPAN., CICUTA.

The fresh Leaves and young Branches of *Conium maculatum*, L., as well as the dried unripe Fruits, are official in the *B.P.*; the full-grown but unripe Fruit, carefully dried and preserved, is official in the *U.S.P.*; the dried Leaves and flowering Stem Tops are official in the *P.G.* The *U.S.P.* requires the Fruit to yield not less than 0·5 p.c. of Coniine.

Medicinal Properties.—Sedative and antispasmodic; allays the cough in bronchitic affections, pertussis, and phthisis. Has been recommended in chorea and other spasmodic affections; also in visceral neuralgias and gastric pains. Applied externally in the form of **ointment** to ease pain of anal fissure or of hæmorrhoids, and cancer.

Dose.—Of the Succus 1 to 2 fl. drm. = 3·6 to 7·1 c.c. Of the Tincture 30 to 60 minims = 1·8 to 3·6 c.c.

Ph. Ger. maximum single dose, 0·2 gramme; maximum daily dose, 0·6 gramme.

Prescribing Notes.—*In consequence of the great variation in strength of Conium preparations, the standardised Fluid Extract or Coniinæ Hydrobromidum should be prescribed. 1 fl. drm. of the Fluid Extract is about equal to 1 fl. oz. of Succus Conii (average strength).*

Incompatibles.—Caustic Alkalis, and vegetable Astringents.

Official Preparations.—Succus Conii from the **Folia.** Unguentum Conii from the **Succus.** Tinctura Conii from the **Fructus.**

Not Official.—Extractum Conii, Extractum Conii Liquidum, Pessus Coniinæ, Pilulæ Conii Compositæ, Vapor Coniinæ, Coniina, Coniinæ Hydrobromidum, and Coniinæ Hydrochloridum.

Antidotes.—In case of poisoning by Hemlock, stomach-tube or emetics, followed by stimulants, Strychnine hypodermically, artificial respiration.

CONII FOLIA. Conium Leaves.

The fresh Leaves and younger Branches of *Conium maculatum*, collected when the fruit begins to form.

Foreign Pharmacopœias.—Official in Austr., Ger., Mex., Port. and Span. Not in Belg., Dan., Dutch, Fr., Hung., Ital., Jap., Norw., Russ., Swed., Swiss or U.S.

Descriptive Notes.—Conium has pinnately decompound leaves and is distinguished from other British umbelliferous plants having similar leaves by the purplish spots on the stem and petioles of the leaves, by the mouse-like odour evolved when rubbed with Liquor Potassæ, and by the leaves being quite free from hairs. The extreme points of the leaf segments are white or colourless, whilst in *Æthusa Cynapium*, L., which has also hairless leaves, the tips are brown, and it has no general involucre to the umbels as in Conium, but only a partial one of three long bracts. The fresh leaves of Conium only are official and are in best condition at the end of June and beginning of July. Such of the British species of the genus *Chærophyllum* as resemble Conium in appearance, have hairy leaves and cylindrical fruits. Under the microscope it is distinguished by striated epidermal cells, by the parenchymatous cells containing minute, usually single, crystals of Calcium Oxalate, the absence of hairs, and the presence of annular as well as spiral vessels.

Tests.—Conium leaves when bruised possess a strong and peculiar odour, somewhat resembling that of mice; and when the leaves are rubbed with Potassium or Sodium Hydroxide Solution the odour is intensified.

Preparations.

SUCCUS CONII. Juice of Conium.

3 of Juice, obtained from the fresh Leaves and young Branches, preserved by the addition of 1 of Alcohol (90 p.c.).

Dose.—1 to 2 fl. drm. = 3·6 to 7·1 c.c.

Much larger doses are also given.

UNGUENTUM CONII. Conium Ointment.

Evaporate 8 of the Juice of Conium on a water-bath to 1, at a temperature not exceeding 140° F. (60° C.), and mix with 3 of Hydrous Wool Fat.

Contrary to what might have been expected, the alkaloidal strength of the juice is not affected by the evaporation, but it is better to evaporate the juice to 2 and to use Anhydrous Wool Fat, also to add 2 p.c. of Boric Acid.

Becomes mouldy on keeping.—*P.J.* '98, ii. 165, 232.

Not Official.

EXTRACTUM CONII.—Made from the fresh leaves and young branches of Hemlock.—*B.P.* 1885.

This has been incorporated in the *B.P.C.*

PILULÆ CONII COMPOSITÆ.—Extract of Hemlock, 5; Ipecacuanha, in powder, 1; Treacle *q.s.*—*B.P.* 1885.

This has been incorporated in the *B.P.C.*

VAPOR CONIINÆ.—Juice of Hemlock, ½ fl. oz.; Solution of Potash, 1 fl. dr.; Distilled Water, 1 fl. oz.—*B.P.* 1885.

This has been incorporated in the *B.P.C.*

CONII FRUCTUS. CONIUM FRUIT.

The dried, full-grown, unripe Fruits of *Conium maculatum.*

Conium Fruits are not officially required to yield any definite percentage of Coniine. The *U.S.P.* states that they shall yield not less than 0·5 p.c. of Coniine. The standard adopted by the *U.S.P.* has been criticised as being too low, but the standard is justified (*Y.B.P.* '05, 398).

Foreign Pharmacopœias.—Official in Fr., Mex., Port., Span. and U.S.

Descriptive Notes.—Conium fruits are ovoid, greyish-green, slightly compressed laterally, and, as met with in commerce, consist of the separate mericarps. The size is given in *B.P.* as ⅛ inch (3 mm.) long, and nearly as broad; in *U.S.P.* as 3 mm. long, and about 1·5 mm. in diameter. The five dorsal ridges are more or less wavy and irregularly crenate, this feature being most conspicuous before the fruits are fully ripe. The surface between the ridges is glabrous but minutely wrinkled. The flat surface shows a narrow deep depression which gives a reniform outline to a transverse section of the mericarp. The *U.S.P.* states that Conium fruit after being kept for more than two years is unfit for use. Although vittæ are present in the very young fruit they subsequently disappear and are absent in the fruit when mature. Conium Fruits are characterised under the microscope by thin-walled nearly cubical cells, which form a layer outside the endosperm. The Coniine and an essential oil are contained in the cells of the endocarp, so that a finely powdered fruit is not necessary for its extraction.

Tests.—The percentage of Coniine present in Conium Fruits may be determined by extraction with suitable solvents, and weighing the alkaloid as a Hydrochloride. A weighed quantity of 5 grammes of the finely-powdered fruit is extracted with 50 c.c. of a saturated solution of dry Hydrochloric Acid gas in Chloroform. The extraction with a further quantity of a similar mixture is continued until 6 drops of the chloroformic mixture evaporated on a watch-glass, and the residue acidified with Diluted Sulphuric Acid, gives no precipitate with Mayer's reagent. The mixed chloroformic liquids after separation from the marc are shaken with two separate quantities of 25 c.c. each of Water. The mixed aqueous shakings are in turn separated, shaken twice with 10 c.c. of Chloroform, and the Chloroform separated. The aqueous portion is made alkaline by the addition of Sodium Hydroxide Solution, and the liberated alkaloid extracted by shaking with three successive portions each of 10 c.c. of Chloroform. The chloroformic liquids are separated in each case, mixed, run into 10 c.c. of the saturated solution of dry Hydrochloric Acid gas in Chloroform, evaporated to dryness on a water-bath, the residue dried at a temperature not exceeding 90° C. (194° F.), and weighed; 162·41 parts of anhydrous Coniine Hydrochloride represent 126·22 parts of Coniine.

The method of determination adopted by the *U.S.P.* is essentially as follows:—A weighed quantity of 10 grammes of the Fruit in No. 60 powder is shaken at intervals during four hours in an Erlenmeyer flask, with 100 c.c. of a mixture of 98 parts of Ether, 8 parts of Alcohol (94·9 p.c.), and 3 parts by volume of Ammonia Water. A measured quantity of 50 c.c. of the clear liquid is decanted into a beaker, and mixed with sufficient Normal Volumetric Sulphuric Acid Solution to produce an acid reaction. The Ether is evaporated on a water-bath, 15 c.c. of Alcohol (94·9 p.c.) added, and the mixture set aside for two hours to permit of the Ammonium Sulphate depositing, the Tincture filtered, the residue and filter washed with a little Alcohol (94·9 p.c.), and the washings mixed with the filtrate. The excess of acid is neutralised by Sodium Carbonate, a slight acidity being carefully maintained. The liquid is now carefully concentrated on a water-bath to a volume of 3 c.c., mixed with an equal volume of Water and 2 drops of Normal Volumetric Sulphuric Acid Solution. The liquid is washed with two successive quantities each of 15 c.c. of Ether, the ethereal liquids separated, the acid liquid transferred to a separator, sufficient Sodium Carbonate Test-solution added to render the liquid distinctly alkaline to red Litmus paper, and the liberated alkaloid shaken out with successive portions of 15 c.c., 15 c.c., and 10 c.c. of Ether. The ethereal solutions are in each case separated, transferred to a tared beaker, and sufficient 5 p.c. Hydrochloric Acid solution added to the mixed ethereal solutions to render them distinctly acid. The Ether is removed by evaporation at a gentle heat on a water-bath, and the excess of Hydrochloric Acid by adding two separate quantities of 3 c.c. each of Alcohol (94·9 p.c.), and removing them in each case by evaporation. The residue is dried at a temperature not exceeding 60° C. (140° F.). This weight, multiplied by 0·777 and the product by 20, gives the percentage of Coniine present in the Fruit.

Coniine may be titrated with Normal or Deci-normal Volumetric Hydrochloric Acid Solution, using Methyl Orange Solution as an indicator of neutrality; 1 c.c. of the Normal Acid represents 0·012622 gramme of Coniine.

Preparation.

TINCTURA CONII. Tincture of Conium.

1 of Conium Fruit, recently reduced to No. 40 powder, percolated with Alcohol (70 p.c.), *q.s.* to yield 5.

Now 1 in 5 instead of 1 in 8.

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

Foreign Pharmacopœias. Official in Port., Tinct. Cicutæ, 1 in 5, also Fresh Herb 1, Spirit 1; Mex., Leaves, 1 in 5. Not in the others.

Tests.—Tincture of Conium possesses a specific gravity of from 0·895 to 0·900; contains about 1·75 p.c. of total solids and about 68 p.c. w/v of Absolute Alcohol. The *B.P.* Tincture is not a standardised preparation, and no process for the quantitative determination of the Coniine is given.

Not Official.

EXTRACTUM CONII LIQUIDUM.—A standardised Liquid Extract prepared by treating 100 of Conium Fruit (in No. 40 powder) with a mixture of 100 of Alcohol (60 p.c.) and 1¼ of Acetic Acid; the exhaustion is completed with Alcohol (60 p.c.); finally the liquid is adjusted to contain 1 p.c. w/v alkaloidal hydrochlorides.—*B.P.C. Formulary* 1901, incorporated in the *B.P.C.*

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

The *U.S.P.* has also a Fluidextractum Conii, about 1 in 1, which is standardised to contain 0·45 p.c. w/v of Coniine. It is prepared by treating 100 of Conium Fruit in No. 40 powder with a mixture of 98 of Alcohol (60 p.c.) and 2 of Acetic Acid (*U.S.P.*); the exhaustion is completed with Alcohol (60 p.c.).

Tests.—The *U.S.P.* mixes a measured quantity of 10 c.c. of the Fluid Extract with a little clean sand and evaporates to dryness on a water-bath. After the Extract and the sand are uniformly mixed they are transferred to an Erlenmeyer flask and shaken at intervals during one hour with 100 c.c. of a mixture of 100 c.c. of Ether, 7 c.c. of Alcohol (94·9), and 3 c.c. of Ammonia Solution, the dish being washed out with the mixture, and the mixture added in portions. A measured quantity of 50 c.c. of the clear liquid is decanted into a beaker, and sufficient Normal Volumetric Sulphuric Acid Solution added to produce a distinctly acid reaction. The Ether is removed by evaporation, 15 c.c. of Absolute Alcohol added, and the Ammonium Sulphate allowed to deposit during two hours. The liquid is filtered, the residue and filter washed with a little Absolute Alcohol, the washings being added to the filtrate. The excess of acid is neutralised by the careful addition of Sodium Carbonate Test Solution, a slight acidity being maintained. The liquid is concentrated by evaporation on a water-bath, to a volume of 3 c.c., mixed with an equal volume of Water and 2 drops of Normal Volumetric Sulphuric Acid Solution. The acid liquid is washed with two successive portions each of 15 c.c. of Ether, the acid liquid separated in each instance, it is transferred to a separator, sufficient Sodium Carbonate Test Solution added to render the liquid distinctly alkaline to red Litmus paper, and the liberated alkaloid removed by extraction with successive portions of 15 c.c., 10 c.c., and 10 c.c. of Ether. The ethereal solutions are separated in each case, transferred to a tared beaker, mixed, and sufficient of a 5 p.c. Hydrochloric Acid Solution added drop by drop to ensure an excess of acid. The Ether is then removed by distillation, the excess of Hydrochloric Acid by evaporating twice with successive portions of 3 c.c. of Alcohol (94·9 p.c.), the residue dried at a temperature not exceeding 60° C. (140° F.), till constant in weight, and weighed after cooling in a desiccator. The weight multiplied by 0·777 and the product by 20 gives the p.c. w/v of Coniine present in the sample of Fluid extract.

The *B.P.C.* states, 'determine the proportion of alkaloids in the strong liquid extract, and adjust the finished product so that it shall contain alkaloids equivalent to 1·0 p.c. of alkaloidal hydrochlorides,' but does not give the details of any process by which they may be determined.

PESSUS CONIINÆ.—Coniine, ½ minim; Gelatin Basis, 20 grains.—*Women.*

Coniine Hydrobromide, ½ grain; Oil of Theobroma, 120 grains.—*B.P.C.*

CONIINA. *Syn.* CICUTINE. $C_8H_{17}N$, eq. 126·22.—A colourless, or pale yellow, volatile oily liquid, with a characteristic penetrating mousy odour. Obtained from *Conium maculatum.* It unites with acids to form crystalline salts, which are much more stable than the alkaloid.

Solubility.—1 in 100 of Water. It mixes in all proportions with Alcohol (90 p.c.) and with Ether.

Causes a very great increase in the blood pressure when injected (*L.* '05, i. 851); the effect, however, is transient, and prolonged administration causes paralysis.

Dose.—It has been given in doses of $\frac{1}{12}$ grain to 1 grain = 0·0054 to 0·06 gramme; but the Foreign Pharmacopœias give much smaller doses, 1 to 4 milligrammes = $\frac{1}{64}$ to $\frac{1}{16}$ grain.

Foreign Pharmacopœias.—Official in Mex. Not in the others.

Tests.—Coniine has a specific gravity of 0·886 (Schorm), 0·844 (Ladenburg). It boils at about 169° C. (336·2° F.). It is dextrogyrate, its specific rotation being +13·8° for the Sodium ray.

The aqueous solution of Coniine is powerfully alkaline in reaction. When a glass rod moistened with concentrated Hydrochloric Acid is held closely over a small quantity of Coniine contained in a watch-glass, white fumes are produced, and if sufficient of the fumes be passed over the surface of the alkaloid, it is wholly converted into a crystalline Hydrochloride; Nicotine Hydrochloride is amorphous.

On the addition of a large excess of concentrated Hydrochloric Acid to Coniine a pale red tint is produced, gradually deepening in colour; Sulphuric Acid gives no immediate change with pure Coniine, but the mixture gradually becomes purple-red and then olive-green. It may be distinguished from Nicotine by producing with Mercuric Chloride Solution a white amorphous, instead of a crystalline precipitate; by its non-precipitation with Platinic Chloride Solution; and by its alkalinity to Phenolphthalein Solution, an aqueous solution of Coniine being coloured red immediately on the addition of 1 or 2 drops of Phenolphthalein Solution; Nicotine is neutral to Phenolphthalein Solution. When heated slowly with free access of air it is completely volatilised, leaving no weighable residue.

CONIINÆ HYDROBROMIDUM. Coniine Hydrobromide $C_8H_{17}N,HBr$, eq. 206·57.—Transparent, colourless, rhombic crystals, or a white, crystalline powder. The usual form for prescribing Coniine, of which it contains about 60 p.c.

It should be protected as far as possible from the light in well-closed glass bottles of a dark amber tint.

Solubility.—1 in 2 of Water; 1 in 3 of Alcohol (90 p.c.).

Dose.—$\frac{1}{6}$ to 2 grains = 0·01 to 0·13 gramme.
For **hypodermic** use, $\frac{1}{12}$ grain in 5 minims of Water.

Official in Fr. (1908) and Mex.

Tests.—Coniine Hydrobromide melts according to *Fr. Codex* (1908) at 211° C. (411·8° F.) The Coniine obtained from the Hydrobromide answers the tests distinctive of the alkaloid given under that heading. When a small quantity of salt is moistened with a few drops of Potassium or Sodium Hydroxide Solution the peculiar mousy odour of Coniine is evolved. The aqueous solution acidified with diluted Nitric Acid gives on the addition of Silver Nitrate Solution a yellowish-white curdy precipitate, practically insoluble in Ammonia Solution and in Nitric Acid. The salt should leave no weighable residue when ignited with free access of air.

CONIINÆ HYDROCHLORIDUM.—Colourless crystals, readily soluble in Water and in Alcohol (90 p.c.).

Tests.—The Coniine isolated from Coniine Hydrochloride responds to the test for the alkaloid given under that heading. When moistened with 1 or 2 drops of Potassium or Sodium Hydroxide Solution, the peculiar mousy odour of Coniine is evolved. The aqueous solution acidified with Nitric Acid yields with Silver Nitrate Solution a white curdy precipitate insoluble in Nitric Acid, soluble in Ammonia Solution. The salt when incinerated with free access of air leaves no weighable residue.

Not Official.

CONVALLARIA.

The entire Plant of *Convallaria Majalis*, L. (Lily of the Valley), gathered when the flowers commence to open, and dried.

Medicinal Properties.—A cardiac tonic; diuretic. Not cumulative like Digitalis, but according to Mitchell Bruce it is a very uncertain remedy. It has been long employed by the Russian peasantry as a remedy for dropsy. The late Professor Sée considered that it may be used in all forms of heart failure, for it has none of the nauseating effects of Digitalis, nor does it exhaust the contractility of the heart and arteries.

The juice of fresh plant stated (*P.J.* '04, ii. 967) to contain 0·225 p.c. Convallamarin, and 0·12 p.c. Convallarin.

Foreign Pharmacopœias.—Official in Austr., Fr. (Muguet), Ital. (Mughetto), Mex., Span. (Lirio de los Valles) and U.S. Not in the others.

Convallaria contains 2 glucosides—**Convallarin**, a purgative, and **Convallamarin**, allied to Digitalin in its action on the heart; the dose of the latter is ⅛ to 2 grains = 0·008 to 0·13 gramme.

EXTRACTUM CONVALLARIÆ (*Fr.*, *Ital.* and *Span.*).—An aqueous extract of the Stalks and flowers of Convallaria freshly gathered and dried. Mex., from roots.

Dose.—2 to 5 grains = 0·13 to 0·32 gramme three times a day.

Ital. maximum single dose, 0·20 gramme; maximum daily dose, 1·0 gramme.

FLUIDEXTRACTUM CONVALLARIÆ (*U.S.*).—1 in 1, from the rhizome and roots of Convallaria, with a mixture of Alcohol (95 p.c.) 650, and Water 350 = about Alcohol (60 p.c.).

Average Dose.—8 minims = 0·5 c.c.

Russ. has a Tincture from fresh Flowers.

B.P.C. has 1 in 1 Fluid Extract, dose 5 to 10 minims, and a Tincture 1 in 8, dose 5 to 20 minims; both are made from the dried Flowers with Alcohol (60 p.c.).

COPAIBA.

COPAIBA.

B.P.Syn.—Copaiva.

Fr., Copahu; Ger., Copaivabalsam; Ital., Balsamo di Copaive; Span., Oleo Resina de Copaiba.

An Oleo-Resin, obtained from the trunk of *Copaifera Lansdorfii*, Desf., as well as from other species of Copaifera.

Obtained from the northern part of South America. The commercial varieties Para, Maranham, Maracaibo, and Angostura are named from the various ports of shipment.

Solubility.—(Nearly clear) 1 in 1 (*or less*) of Alcohol (90 p.c.), but if more Alcohol be added it becomes cloudy; in all proportions of Absolute Alcohol, Ether, Benzol, and the fixed and volatile Oils; also in four times (*or less*) its bulk of Petroleum Spirit, the solution only yielding a filmy deposit on standing; also 1 in 2 (*or less*) of Glacial Acetic Acid.

Medicinal Properties.—Stimulant, antiseptic, and diuretic. Acts more particularly upon the mucous membrane of the genito-urinary tract. Used in gonorrhœa, after the acute stage has passed, and in gleet. Sometimes combined with Buchu and Cubebs.

Useful in chronic bronchitis and bronchiectasis, when a disinfectant expectorant is indicated. The **resin** is used as a diuretic in cardiac and hepatic dropsy, but not in renal, as it is liable to irritate the kidneys.

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

Prescribing Notes.—*Can be given in the form of* **pills** *or* **paste** (*see below*), *also in* **capsules.** *It may be suspended in Water by means of Mucilage of Gum Acacia* (*see p.* 3), *or Liquor Potassæ, which saponifies it. Cinnamon Water, Peppermint Water, the Tinctures of Orange and Ginger have been used as flavouring agents. The* **Oil** *of Copaiba can be suspended by means of Mucilage, as can also the* **Resin** *of Copaiba.*

When Copaiba is boiled with Solution of Potassium Hydroxide the Oil is emulsified, and the Resin separates on standing. The liquid portion is consequently miscible with Water.

Official Preparation.—Oleum Copaibæ.

Not Official.—Electuaire de Copahu Composé, Liquor Copaibæ Solubilis, Liquor Copaibæ, Buchu et Cubebæ, Liquor Copaibæ cum Santalo, Liquor Copaibæ et Buchu, et Cubebæ cum Santalo, Haustus Copaibæ, Mistura Copaibæ, Mistura Copaibæ Acida, Mistura Copaibæ Alkalina, Pasta Copaibæ, Pilula Copaibæ, Resina Copaibæ.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port. (Terebinthina Copahiba), Russ., Span., Swed., Swiss and U.S.

Descriptive Notes.—The oleo-resin, incorrectly designated in commerce Balsam of Copaiba, varies considerably in consistence, according to the species of Copaifera from which it is derived. These, besides the species mentioned in the *B.P.*, viz., *C. Lansdorfii* (the source of Maranham Copaiba), are believed to be *C. officinalis*, L. (Maracaibo and Cartagena Copaiba), *C. Guianensis*, Desf. (Surinam Copaiba and B. Guiana Copaiba), *C. coriacea*, Mart. (Bahia Copaiba); *C. confertiflora*, Benth., *C. oblongifolia*, Mart., and *C. rigida*, Benth., are also believed to yield some of the Copaiba of commerce. The *B.P.* lays no restriction upon the species from which it may be derived. The Para kind (*C. multijuga*, Hayne), which is the most fluid and the palest in colour, almost resembling Olive oil in colour and consistence, yields 60 to 90 p.c. of volatile oil, and is therefore chiefly used for distilling the oil. The Maracaibo, which is thicker and of a brownish colour, like that of Maranham, and with a greenish fluorescence, yields only about 40 p.c., and that from Bahia about 50 p.c.; the Maranham kind is preferred in Germany.

When a Copaiba containing much oil is desired, the Para, Surinam, and British Guiana kinds are most suitable, and when one containing much resin is required, the Maranham and Maracaibo and Cartagena are preferable. Gurjun balsam resembles the darker varieties of Copaiba in colour and consistence, but if heated to 130° C. (266° F.) it is transformed into a jelly.

Tests.—Copaiba has a specific gravity of from 0·985 to 0·994; *B.P.* gives 0·916 to 0·993; the *U.S.P.* 0·950 to 0·995 at 25° C. (77° F.); the *P.G.* 0·980 to 0·990. It should contain at least 40 p.c. of volatile oil, which should possess an optical rotation of from −14° to −17°, and a boiling point of 245° to 275° C.

(473° to 527° F.); *B.P.*, not under 250° C. (482° F.). This volatile oil should not possess an odour of Turpentine, and if after its volatilisation the Balsam be heated until the volatile constituents are removed a hard readily friable residue should remain. The Acid and Ester value afford a useful criterion of the quality of the Balsam, but a method for their determination is not included in the *B.P.* The *U.S.P.* and the *P.G.* include a determination of the Acid value, the *U.S.P.* requiring from 64·10 to 89·18; the *P.G.* 75·8 to 84·24. The *P.G.* includes a determination of the Ester value, which should be not less than 8·2, but no ester value is included in the *U.S.P.* The methods of determination given in the *P.G.* have been severely criticised, and are considered to be of little value, the only variety of Balsam which at all approximates the figures given being the Maranham variety. The figures for the optical rotation of Copaiba given in the *B.P.* require to be halved (*C.D.* '00, ii. 166; '03, i. 18; *P.J.* '00, i. 54; '00, ii. 98), as they represent the rotation of the plane of a ray of polarised light in a tube of 200 mm., and not in a tube of 100 mm. as adopted in other cases. It is probable that even when halved the limits may be too narrow, as some genuine samples of Copaiba yield an oil having a rotation as low as − 9°, and Gildemeister and Hoffmann quote − 7° to − 35° as the rotation of Copaiba Oil from Para or Maracaibo Balsam. It has been suggested (*C.D.* '00, ii. 166; *P.J.* '00, ii. 99) that the *B.P.* might with advantage include a method of determining the percentage of volatile oil in the Balsam, such as by heating a weighed quantity of the Balsam on a water-bath, and finally in a water-oven at a temperature of just below 100° C. (212° F.), until constant in weight. Determinations of the Acid and Ester values of ten samples of the Balsam showed them, with one exception, to vary between 10·64 and 19·60 for the Ester, and 78·96 and 93·52 for the Acid value.

It has also been pointed out (*C.D.* '01, i. 436; *P.J.* '01, i. 326) that it would be useful to include monographs for the Resin as well as the Volatile Oil. The Volatile Oil might be required to possess a specific gravity of 0·903 to 0·908, an optical rotation in a 100 mm. tube of − 7° to − 21°, a boiling point of 245° to 275° C. (473° to 527° F.), and a solubility in Absolute Alcohol of 1 in 1. The Resin should be soluble in Alcohol (90 p.c.), Ether, and Carbon Bisulphide, and should possess an Acid value of at least 119·7. The specific gravity suggested for the Balsam is 0·97 to 0·995, and the Acid Value for the Balsam of at least 75·20.

The Acid value of Maracaibo Copaiba Balsam should be between 76·52 and 94·90, the Ester value from 0·47 to 8·75; the Acid value of Para Balsam should be from 65·8 to 72·0, and the Ester value from 1·9 to 2·9.

The more generally occurring adulterants of Copaiba Balsam are Turpentine oil, fixed oils, *e.g.*, Olive and Castor Oils, Paraffin Oils, Gurjun Balsam, Colophony, and African Copaiba Balsam. Turpentine Oil may be readily detected by the odour on evaporation and the boiling point and rotation of the volatile Oil. Fixed oils are indicated by the character of the Resin remaining after the volatilisation of the ethereal Oil, and by the solubility of the Balsam in Alcohol (90 p.c.), and in Petroleum Ether; the *U.S.P.* includes a test with 20 drops of the Balsam and 1 c.c. of a 1 in 10 alcoholic Potassium Hydroxide Solution, mixing when cool with twice the volume of Ether, no gelatinisation should occur. Paraffin Oils are also readily detected by the solubility of the sample in Alcohol (90 p.c.); when a measured quantity of 5 c.c. of the Balsam is shaken with 15 c.c. Alcohol (94·9 p.c.), the mixture boiled for one minute, allowed to cool and to stand for one hour, no drops of oil should separate. Gurjun Balsam may be detected by the Nitric and Sulphuric Acid, and Acetic and Nitric Acid tests; the *B.P.* employs a cooled mixture of equal parts of Nitric and Sulphuric Acids, and Glacial Acetic Acid containing a small quantity of Nitric Acid, as tests for the absence of Gurjun Balsam, no transient violet coloration should be produced when 1 drop of the former mixture is added to 2 drops of the Balsam dissolved in 20 parts of Carbon Bisulphide, nor should a reddish or purple colour be yielded when 4 drops of the Balsam are carefully added to ½ oz. of Glacial Acetic Acid, to which has been added 4 drops of Nitric Acid. The *U.S.P.* uses Glacial Acetic Acid mixed with a few drops of Nitric Acid in performing this test, but gives more explicit directions for its application. No reddish zone should be produced, nor should the fluid assume a red or purple colour when 4 drops of Copaiba are carefully poured on top of a mixture of 1 drop of Nitric Acid (sp. gr. 1·40) and 3 c.c. of Glacial Acetic Acid. Colophony may be detected by shaking 1 gramme of Copaiba, in a stoppered vial, with 10 c.c. of Ammonia Solution, when allowed to stand 24 hours it should not gelatinise, nor should a firm mass be produced, but the liquid will become turbid. African Copaiba yields on distillation a volatile oil which is dextrogyrate, and its presence may be ascertained by its effect on the optical rotation of the distilled oil.

Volumetric Determination.—1 gramme of Copaiba, dissolved in 50 c.c. of Alcohol, should require not less than 2·3 c.c. and not more than 3·2 c.c. (2·7 c.c. to 3 c.c., *P.G.*) of the Semi-normal Volumetric Alcoholic Solution of Potassium Hydroxide for neutralisation, using 1 c.c. Phenolphthalein Solution (10 drops, *P.G.*) as indicator, *P.G.* and *U.S.P.* If a further addition of 20 c.c. of Semi-normal Volumetric Alcoholic solution of Potassium Hydroxide be made, and the mixture warmed for 15 minutes on a water-bath, and titrated with Semi-normal Volumetric Solution of Hydrochloric Acid, it should require for the neutralisation of the excess of Potassium Hydroxide at least 19·7 c.c. of the Acid Solution, *P.G.*

OLEUM COPAIBÆ. Oil of Copaiba.

A yellow, or yellowish-brown, oily liquid, distilled from Copaiba. It has a distinctive Copaiba odour and a bitter, persistent taste.

It should be kept in well-closed glass bottles of a dark amber tint in a cool atmosphere, and protected as far as possible from the air and light.

Copaiba Oil contains, according to Gildemeister and Hoffmann, a sesquiterpene Caryophyllene, yielding Caryophyllene Hydrate in crystals, melting at 96° C. (204·8° F.) on treatment with Glacial

Acetic Acid and Sulphuric Acid. A crystalline acid melting at 140° C. (284° F.), which has been identified as a symmetric Dimethyl-succinic Acid, has also been noted, but doubt is expressed as to whether the acid owes its origin to Caryophyllene or some other minor constituent of the oil.

Solubility.—1 in 20 of Alcohol (90 p.c.); nearly insoluble in Alcohol (60 p.c.); mixes in all proportions with Absolute Alcohol.

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

Foreign Pharmacopœias. Official in U.S. Not in the others.

Tests.—Copaiba Oil has a specific gravity of 0·903 to 0·908, the gravity varying considerably with the age of the oil and its exposure to the air—the official figures are 0·900 to 0·910; it is laevogyrate, the optical rotation being from − 7° to − 21° in a 100 mm. tube. It boils between 245° and 275° C. (473° and 527° F.). It is neutral in reaction, and is soluble in its own volume of Absolute Alcohol. The more generally occurring adulterants are African Copaiba Oil and Gurjun Balsam Oil: the former is dextrogyrate, and may be detected by its effect on the optical rotation of the oil; the latter is recognised by its higher specific gravity and greater optical activity, which amounts generally to about − 35° to − 130° in a 100 mm. tube, though dextrogyrate oils are also known to exist. The presence of Gurjun Balsam Oil may also be detected by the test with Acetic and Nitric Acids given under Copaiba.

Not Official.

ELECTUAIRE DE COPAHU COMPOSÉ.—Copaiba, 100; Cubebs in powder, 150; Catechu in powder, 50; Oil of Peppermint, 3.—*Fr.*

LIQUOR COPAIBÆ SOLUBILIS.—Boil 20 of Copaiba with 30 of Solution of Potash for an hour, add 10 of Water, and mix thoroughly. Set aside until cold and well separated, draw off the clear liquor from the upper oily portion and the sediment, and evaporate it to 38; to this add 2 of Solution of Potash.—*Pharm. Form.* and the *Australian Pharmaceutical Formulary.*

This has been incorporated in the *B.P.C.*

LIQUOR COPAIBÆ, BUCHU ET CUBEBÆ.—Liquid Extract of Buchu, 1; Liquid Extract of Cubebs, 1; Solution of Copaiba, 8.—*Pharm. Form.*

This has been incorporated in the *B.P.C.*

LIQUOR COPAIBÆ CUM SANTALO.—Oil of Santal, 1; Alcohol (90 p.c.), 1; Solution of Copaiba, 8. The liquor is sometimes flavoured with Cinnamon or other essential oil, 5 to 10 minims to the ounce. Oil of Sandal Wood can also be combined with Solution of Copaiba, Buchu et Cubebæ in the same manner as above.—*Pharm. Form.*

Solution of Copaiba, 80; Oil of Sandal Wood, 10; Oil of Cassia, ½; Alcohol (90 p.c.), *q.s.* to make 100.—*B.P.C.*

Liquor Copaibæ et Buchu et Cubebæ cum Santalo.—Solution of Copaiba, Buchu, and Cubebs, 80; Oil of Sandal Wood, 10; Oil of Cassia, ½; Alcohol (90 p.c.), *q.s.* to produce 100.—*B.P.C.*

HAUSTUS COPAIBÆ.—Copaiba, 15 minims; Solution of Potassium Hydroxide, 5 minims; Spirit of Nitrous Ether, 15 minims; Mucilage of Gum Acacia, 60 minims; Camphor Water, to 1 fl. oz.—*St. Bartholomew's.*

MISTURA COPAIBÆ (*Lafayette*).—Copaiba, 4; Spirit of Nitrous Ether, 4; Compound Tincture of Lavender, 4; Solution of Potassium Hydroxide, 1; Syrup, 10; Mucilage of Acacia, *q.s.* to make 32. Mix the Copaiba with the

Solution of Potassium Hydroxide and the Spirit of Nitrous Ether, then add the Compound Tincture of Lavender, and lastly the Syrup and Mucilage of Acacia. Well mix by shaking. —*U.S.N.F.*

MISTURA COPAIBÆ (*Chapman*).—Copaiba, 8; Spirit of Nitrous Ether, 8; Compound Tincture of Lavender, 2; Tincture of Opium, 1; Mucilage of Acacia, 4; Water, *q.s.* to make 32.—*U.S.N.F.*

MISTURA COPAIBÆ.—Copaiba, 15 minims; Mucilage of Acacia, 60 minims; Magnesium Sulphate, 30 grains; Cinnamon Water, to 1 fl. oz.—*St. Mary's.*

Copaiba, 20 minims; Tincture of Quillaia, 20 minims; Spirit of Nitrous Ether, 30 minims; Camphor Water, to 1 fl. oz.—*Charing Cross.*

Copaiba, 15 minims; Mucilage of Gum Acacia, 30 minims; Water, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

MISTURA COPAIBÆ ACIDA.—Copaiba, 20 minims; Dilute Sulphuric Acid, 10 minims; Mucilage of Acacia, ½ fl. oz.; Water, to 1 fl. oz.—*King's.*

MISTURA COPAIBÆ ALKALINA.—Copaiba, 20 minims; Solution of Potash, 10 minims; Mucilage of Acacia, 2 fl. dr.; Water, to 1 fl. oz.—*King's.*

PASTA COPAIBÆ.—Copaiba, 8; Powdered Cubebs, 24; Extract of Hyoscyamus, 1; Camphor, 1; Treacle, *q.s.*

Dose.—A piece the size of a filbert nut three or four times a day in gonorrhœa. —*L.* '88, i. 1019.

PILULA COPAIBÆ.—Copaiba, 94; Magnesia, 6; mix intimately and set aside to concrete. Should the mixture not concrete in eight or ten hours, the Copaiba before use should be shaken with $\frac{1}{20}$ of its weight of Water, then the uncombined Water allowed to subside and the Copaiba poured off.

Foreign Pharmacopœias.—Official in Span. (Pildoras de Copaiba).

RESINA COPAIBÆ.—Prepared from the Oleo-resin by distilling off the Volatile Oil.

A yellowish, or brownish-yellow, brittle resin, with an acid reaction. Soluble in Alcohol.

Tests.—Copaiba Resin is soluble in Alcohol (90 p.c.), Ether, and Carbon Bisulphide. It possesses an Acid value of not less than 119·77.

CORIANDRI FRUCTUS.

CORIANDER FRUIT.

Fr., Coriandre; Ger., Koriander; Ital., Coriandro; Span., Cilantro.

The dried, ripe Fruit of *Coriandrum sativum*, L.

Medicinal Properties.—Stimulant, aromatic, and carminative.

Dose.—20 to 60 grains = 1·3 to 4 grammes.

Official Preparation.—Oleum Coriandri. Contained in Confectio Sennæ, Syrupus Rhei, Tinctura Rhei Composita, and Tinctura Sennæ Composita. The Oil is contained in Syrupus Sennæ.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Hung., Mex. (Culantro) Norw., Port. (Coentro), Span. and U.S. Not in Ger., Ital., Jap., Russ., Swed. or Swiss.

Descriptive Notes.—The Coriander Fruit of commerce has the two mericarps united, and is globular, about $\frac{1}{5}$ inch (5 mm.) in diameter, of a buff or light brown colour (brownish yellow, *B.P.*), glabrous, crowned with minute calycine teeth, and the conical base of the two slender divergent styles. There are four prominent secondary ridges, and five inconspicuous wavy primary ridges alternate with them on each mericarp, but there are no vittæ between them, there being only two vittæ on the concave commissural surface of each mericarp. The taste and odour of the dried fruit are agreeably aromatic and characteristic, but in the unripe fruit the odour is disagreeable. The fruits are imported from Russia, Germany, Holland, Morocco, and occasionally from Bombay, the last being oval and nearly twice as large as European Coriander, and pointed at the ends. A little is also cultivated in Essex. The English is rather paler and larger than the Dutch kind, which is small. The Russian is smaller than the other kinds. For distillation the fruits need to be previously crushed so as to expose the vittæ, which are found only on the inner surface of the mericarps. The powder of the fruits as seen under the microscope is characterised by the obliquely arranged linear cells of the endosperm, longer than those of Fennel, the sharply defined six-sided cells of the inner coat of the vittæ, and by the thick pitted walls of the large sclerenchymatous cells of the mesocarp. *J. Moeller Leitfaden Mikr. Pharm. Übungen*, 1901, p. 182.

Tests.—Coriander Fruits yield from 5 to 6 p.c. of ash. Five samples examined in the author's laboratory showed 4·69, 5·28, 5·74, 5·15 and 5·8 p.c.; four samples of powdered Coriander gave 5·64, 5·7, 7·09, and 7·79. An ash limit of 6·0 p.c. for the fruits has been suggested.

Preparation.

OLEUM CORIANDRI. Oil of Coriander.

A colourless or pale yellow oily liquid, possessing a strong distinctive aromatic odour and taste.

It should be kept in well-closed glass bottles of a dark amber tint, and protected as far as possible from contact with air and light, and in a cool atmosphere.

Consists to the extent of 90 p.c. of dextrorotatory Linalool, $\mathbf{C_{10}H_{18}O}$; sp. gr. 0·868; boiling point 194° to 198° C. (381·2° to 388·4° F.).

Yield of Volatile oil from Coriandri Fructus.—Moravian, Thuringian and Russian fruits yield, according to Gildemeister and Hoffmann, from 0·8 to 1·0 p.c. of oil; French, 0·4 p.c.; Dutch, 0·6 p.c.; Italian, 0·5 p.c.; Moroccan, 0·2 to 0·3 p.c.; whilst the East Indian fruit yields only 0·15 to 0·2 p.c.

Solubility.—2 in 1 of Alcohol (90 p.c.); 1 in 75 of Alcohol (60 p.c.).

Used to render medicines more palatable, and prevent griping.

Dose.—½ to 3 minims = 0·03 to 0·18 c.c.

Foreign Pharmacopœias.—Official in U.S. Not in the others.

Tests.—Coriander Oil has a specific gravity of from 0·870 to 0·885, is optically dextrogyrate, the rotation amounting to + 8° to + 14° in a 100 mm. tube. It yields a clear solution with three times its volume of Alcohol (70 p.c.).

The more generally occurring sophistications are sweet Orange Oil or Turpentine Oil, which are recognised by their influence on the specific gravity and the optical rotation, the solubility test affording additional evidence of the absence of Oil of Turpentine and added terpenes.

Not Official.

COTO.

A Bark from Bolivia, origin unknown.

Medicinal Properties.—Aromatic stimulant and intestinal astringent. Has been used in chronic diarrhœa.

A precipitate may form when the Tincture or Fluid Extract is diluted with Water, but it diffuses readily, on being shaken, without the aid of Mucilage.

It contains a bitter principle, **Cotoin,** sparingly soluble in Water, soluble in Alcohol; dose, ½ to 2 grains = 0·03 to 0·13 gramme.

Cotoin is recommended as checking the night sweats of phthisis.—*L.* '96, i. 255.

Paracotoin is obtained from an allied bark, which has similar properties sparingly soluble in Water, soluble in Alcohol.

Dose.—2 to 3 grains = 0·13 to 0·2 gramme.

Descriptive Notes.—Coto bark as originally introduced into commerce is at present not obtainable, its place being taken by Paracoto bark. Both these barks come from Bolivia, the former from the banks of the Magdalena, and the latter from those of the Mapiri River, and are probably derived from trees belonging to the natural order Lauraceæ, so far as can be judged from their structure. Both are hard, heavy, reddish-brown barks occurring in quilled pieces about 6 to 8 inches (15 to 20 cm.) long or more, 2 to 2½ inches (5 to 6 cm.) broad, and about ½ inch (12·5 mm.) thick, with a fracture granular outwardly and coarsely fibrous toward the inner surface. The chief difference between the two is that the inner surface in the true Coto bark is nearly smooth and the bark is thinner, that of Paracoto often being 15 mm. or more thick and having the inner surface rough with projecting longitudinal ridges formed of sclerenchymatous fibres. Both have a pungent aromatic taste and exhibit a minute crystalline efflorescence on the broken surface. The taste of true Coto is rather more peppery than that of Paracoto. The distinctive microscopical characters are the large elongated sclerenchymatous cells, some of which contain granular matter, large parenchymatous cells containing yellow resin, and small simple starch granules. True Coto bark also contains granular reddish-brown oily bodies in some of the parenchymatous cells. The two barks may also be distinguished by the use of concentrated Nitric Acid, which turns Paracoto powder yellowish, changing gradually into a green tint, whilst that of Coto becomes deep red. This reaction is due to the Paracotoin and Cotoin.

TINCTURA COTO.—1 of bruised Coto Bark macerated with Alcohol (90 p.c.) to make 10.—*B.P.C. Formulary* 1894. Incorporated in the *B.P.C.*

Dose.—10 to 30 minims = 0·6 to 1·8 c.c.

Fluid extract (1 in 1); dose, 5 to 20 minims.

Fortoin (Methylene-Dicotoin).—Yellow, crystalline needles, or a light yellow powder. Insoluble in Water, soluble in Chloroform and Acetone. Decomposed by Alkalis. Introduced as an intestinal antiseptic. Has been found useful in infantile diarrhœa.—*P.J.* '99, ii. 168; '01, i. 702.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

CREOSOTUM.

CREOSOTE.

FR., CRÉOSOTE OFFICINALE; GER., KREOSOT; ITAL., CREOSOTO; SPAN., CREOSOTA.

A colourless or more generally a pale yellowish, highly refractive, oily liquid, possessing a strong distinctive odour and a burning, caustic taste. It is a mixture of Guaiacol, Creosol, and other Phenols obtained in the distillation of Wood Tar.

The *B.P.* states that Creosote is 'obtained in the distillation of Wood Tar'; the *U.S.P.*, 'obtained during the distillation of Wood Tar, preferably that derived from the Birch.'

It preserves animal substances from decay, from which property its name is derived. It is to the presence of this substance that the process of smoking hams owes its efficacy.

The two chief constituents of Creosote are **Guaiacol** and **Creosol,** the first of which predominates in some specimens, and the second in others. Beechwood Creosote contains most Guaiacol; formerly it was stated to contain more than 60 p.c., but when the demand for Guaiacol and its salts arose, the proportion in commercial Creosote dropped to 20 p.c. It can now be obtained containing 50 p.c.

Guaiacol is soluble 1 in 80 of Water, and mixes with Glycerin in all proportions. Creosol is soluble 1 in 150 of Water, and will not form a clear mixture with Glycerin in any proportion.

Solubility.—Beechwood Creosote is soluble about 1 in 110 of Water and mixes in all proportions with Alcohol (90 p.c.), Absolute Alcohol, Ether sp. gr. 0·735 and 0·720, Glacial Acetic Acid, Chloroform, Benzol, and Petroleum Spirit; it also mixes with Glycerin in all proportions up to nearly 3 of Glycerin to 1 of Creosote, but on the further addition of Glycerin the mixture is turbid.

'English Creosote' differs from Beechwood Creosote in that it is not nearly so soluble in Water, and does not mix readily with Glycerin. It dissolves about 1 in 350 of Water, and forms a turbid mixture with an equal volume of Glycerin.

Medicinal Properties.—Disinfectant and antiseptic. It resembles Carbolic Acid in action, but it is less poisonous. Given internally in gastric fermentation, in putrefactive diarrhœa, and with considerable success in phthisis with abundant fetid sputum (*see* below); for arresting nausea in hysteria, for obstinate sea-sickness, and the vomiting of pregnancy and phthisis. A lotion (8 minims to 1 oz.) and the **ointment** are used for eruptions of a scaly character, for venereal ulcers, and in parasitic skin diseases; it relieves the itching in eczema; toothache, when depending on caries, is relieved by its application. As an **inhalation** in fetid bronchitis, phthisis, and pulmonary gangrene.

Employed by internal administration with considerable success in phthisis, commencing with 5 minims in 2 fl. drm. of Cod-liver Oil three times daily after meals and gradually increasing till at the end of three or four weeks 30 to 60 minims or even 80 minims are being taken three times daily. It is said to have no tendency to bad effects even in such large doses. Should a patient be unable to take Cod-liver Oil, the Creosote may then be prescribed in spirituous solution. If the best Beechwood Creosote be used and due care exercised in increasing the dose gradually, it will be found to produce good results without unpleasantness or risk.—*B.M.J.* '98, i. 144, 299, 1383.

One drop of Creosote at bedtime every night for juvenile incontinence of urine.—*B.M.J.* '87, i. 809. In diabetes 4 drops daily increased to 10 drops.—*L.* '89, i. 702. Intratracheal injection of Creosoted Oil (1 in 20) to aid the expulsion of false membrane after tracheotomy.—*B.M.J.* '98, i. 1381.

Successful in cases of tuberculosis in children by pills and drops.—*T.G.* '93, 766.

Hypodermic injection of Creosote and Guaiacol dissolved in sterilised Almond Oil, 1 in 5 or 1 in 15.—*L.* '96, ii. 371; *B.M.J.* '95, ii. 1488. Small doses in gastric affections.—*L.* '97, ii. 404. In habitual constipation.—*L.* '97, ii. 932. Enemata containing 8 minims of Creosote in 4 oz. of Cod-liver Oil in pleuro-peritoneal tuberculosis in children.—*L.* '97, i. 159. In malarial intermittent fever 15 minims rubbed into the axilla and covered up with Cotton-Wool produced free perspiration and lowered the temperature.—*B.M.J.* '96, i. 18; '97, i. 1332; *I.M.G.* '96, 11; *T.G.* '96, 325.

Subcutaneous injection the best means of administering large quantities.—*B.M.J.* '01, ii. 219.

Creosote, Guaiacol, and their congeners are stated (*L.* '04, ii. 1827) to be much less used now in the treatment of pulmonary phthisis than a few years ago. An interesting item on Creosote is that each Japanese soldier is expected to carry and take Creosote pills as a prophylactic against dysentery.—*B.M.J.* '04, ii. 1327.

It is of distinct value in the antiseptic treatment of pulmonary tuberculosis (*Edin. Med. Jour.* '05, 463). It often relieves gastric catarrh and stimulates the appetite. It should be given immediately after or before food in 2 or 3 minim doses, beginning with two or three times a day and gradually increasing to three times that amount, in capsules, or dissolved in Cod-liver Oil.

Twenty minims of a mixture of equal parts of a 20 p.c. Alcoholic solution of Creosote and Spirits of Chloroform, used for an hour or so on the sponge of an inhaler, relieves the troublesome cough of pulmonary phthisis.—*Edin. Med. Jour.* '05, 465.

Dose.—1 to 5 minims = 0·06 to 0·3 c.c.

Ph. Ger. maximum single dose, 0·5 gramme; maximum daily dose, 1·5 grammes.

Prescribing Notes.—*Given in* **capsules** *or in* **pills** *made with Soap and Liquorice Powder (see p.* 454). *When given as a draught or mixture it is best emulsified with Mucilage of Gum Acacia and given in Milk, or dissolved in Almond Oil; see 'Guttæ Creosoti' and 'Mistura Creosoti' (Squire). For hypodermic injection, alone or dissolved in Almond Oil. When mixed with Magnesia it forms a tasteless compound insoluble in Water. Orange, Juniper, and Fluid Extract of Liquorice have been used as flavouring agents.*

Incompatibles.—When prescribed in pills with Silver Oxide it explodes, unless previously diluted with some inert powder.

Official Preparations.—Mistura Creosoti, Unguentum Creosoti.

Not Official.—Aqua Creosoti, Elixir Créosoté, Guttæ Creosoti, Mistura Creosoti (*Squire*), Pilula Creosoti, Solutio Creosoti Composita, Vapor Creosoti, Vasolimentum Kreosoti, Parogenum Creosoti, Vin Créosoté, Creosoti Carbonas, Creosoti Oleas, Creosoti Phosphas, Creosoti Tannas, Creosoti Valerianas, Salocreol, Taphosote, Phosphotal, and Pneumin. The preparations of Guaiacol will be found under that name.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—Creosote has a specific gravity of 1·080 to 1·086, and should not be below 1·080; the *B.P.* states not below 1·079. The *U.S.P.* gives not below 1·078 at 25° C. (77° F.); the *P.G.* not below 1·08. Its boiling point is between 200° to 220° C. (392° to 428° F.), between which temperatures the greater portion of it distils. It is either optically inactive or but slightly dextrogyrate. It is neutral or only feebly acid towards Litmus paper. A 1 in 100 solution in Alcohol (90 p.c.) or a 1 in 200 aqueous solution yields with Ferric Chloride Test-solution a green coloration rapidly changing to reddish-brown. Mixed with 10 times its volume of a 1 in 5 Solution of Potassium Hydroxide in Absolute Alcohol it forms a solid crystalline mass.

The more generally occurring impurities are Phenol, Coal Tar Creosote, neutral oils, Cœrulignol, and higher boilingpoint constituents of Wood Tar. The *B.P.* includes tests for Phenol and less volatile constituents. The Ammonia test is that officially adopted for its distinction from Phenol, it being required to suffer no material diminution in volume when shaken with 5 times its volume of Ammonia Solution. The absence of less volatile liquids is officially ensured by the absence of a translucent stain when dropped on to filtering paper and exposed to a temperature of 100° C. (212° F.). The Ammonia test has been stated (*C.D.* '00, ii. 156; *P.J.* '00, ii. 150) not to be of special value, inasmuch as the purest Creosote shows the greatest diminution of volume. The author has found the best differentiating test between Creosote and Phenols to be the insolubility of the former in diluted Glycerin; three measures of Glycerin (sp. gr. 1·260) is diluted with 1 measure of Water and 1 volume of the Creosote sample is shaken with 3 volumes of the diluted Glycerin; after complete separation, the volume of the Creosote layer is read off, the diminution roughly indicating the amount of soluble impurity. If the Glycerin layer be separated and diluted with Water, the Coal Tar acids may be extracted by agitation with Chloroform, thus permitting their further examination. The *U.S.P.* mixes equal volumes of the Creosote and 95 p.c. Glycerin Solution, stating that a clear mixture will result, from which, on the addition of one-fourth volume of Water, a layer of Creosote equal to, or greater than, the volume originally employed will separate. The *U.S.P.* and the *P.G.* use Sodium Hydroxide Solution as a test for the presence of neutral oils; the *U.S.P.* mixing the Creosote with not less than 5 nor more than 9 times its volume of Normal Volumetric Sodium Hydroxide Solution, the *P.G.* mixing it with 2½ times the volume of Sodium Hydroxide Solution (15 p.c.); in each case a clear liquid is required to result, which remains clear on dilution with 50 c.c. of Water. Coal Tar Creosote may be detected by the solubility of the Creosote in hot Water, its subsequent behaviour on cooling, and the behaviour of the filtrate with Bromine Water, the Collodion test, and the Alcoholic Potassium Hydroxide test. The Ferric Chloride test is stated to give an indication, but its usefulness is by no means fully conceded. The behaviour of the sample with Petroleum Ether and freshly prepared Barium Hydroxide Solution forms a useful means of readily detecting the presence of Cœrulignol and some other high boiling point constituents of Wood Tar. The test is described in the small type below.

Fractionation.—When distilled most of it comes over between 392° F. (200° C.) and 428° F. (220° C.), *U.S.P.* and *P.G.* The *B.P.* states that it distils between these temperatures. When cooled to −20° C. (−4° F.) it becomes gelatinous but does not solidify, *U.S.P.* and *P.G.*

Bromine.—The saturated aqueous solution of Creosote separated from the oily globules yields a reddish-brown precipitate with T.S. of Bromine, *P.G.* and *U.S.P.*

Collodion.—If 1 volume of Creosote be shaken with 1 volume of Collodion no gelatinous mass should be formed, *B.P.* and *P.G.*; no permanent coagulum should form when equal volumes of the liquid are stirred together, *U.S.P.*

Potassium Hydroxide.—If 1 c.c. of Creosote be mixed with 10 c.c. of a solution (1 5) of Potassium Hydroxide in Absolute Alcohol, a solid crystalline mass will form, *U.S.P.* and *P.G.*

Benzin and Barium Hydroxide.—If 1 c.c. of Creosote be shaken with 2 c.c. of Petroleum Benzin and 2 c.c. of Baryta Water, the Petroleum Benzin solution should not assume a blue colour or be muddy, and the aqueous liquid should not be coloured red, *P.G.*

If 1 c.c. of Creosote be cautiously and gently shaken with 2 c.c. of Petroleum Benzin and 2 c.c. of a freshly prepared Barium Hydroxide T.S. until of uniform consistence, on complete separation three distinct layers are visible, the middle one of which contains the Creosote unaltered in appearance, while the Petroleum Benzin should not be blue or muddy, and the aqueous layer should not have acquired a red tint, indicating the absence of Cœrulignol and some other high boiling constituents of Wood Tar, *U.S.P.*

Preparations.

MISTURA CREOSOTI. Creosote Mixture.

Shake 16 minims of Creosote with 14 fl. oz. of Distilled Water; add 1 fl. oz. of Syrup and 16 minims of Spirit of Juniper, and Distilled Water, *q.s.* to yield 16 fl. oz. (1 in 480)

It was pointed out in the *Companion* that Glacial Acetic Acid was quite unnecessary, and it is now omitted.

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.

UNGUENTUM CREOSOTI.—Creosote Ointment.

Creosote (by weight), 1; Hard Paraffin, 4; Soft Paraffin, white, 5; add the Creosote to the melted Paraffins, and stir until cold. (1 in 10)

Now made with Hard and Soft Paraffins in place of Simple Ointment.

Not Official.

AQUA CREOSOTI.—Creosote, 10; Distilled Water, 990. Agitate the Creosote vigorously with the Distilled Water, and filter through a well-wetted filter. Creosote Water should be freshly prepared when dispensed.—*U.S.P.*

This has been incorporated in the *B.P.C.* under the title **Liquor Creosoti** with *syn.* Aqua Creosoti.

ELIXIR CRÉOSOTÉ.—Creosote, 1; Rum, 66; mix and filter.

Spiritus Creosoti.—Creosote, 1; Alcohol (90 p.c.), 40. Dose.—1 drm. —*Martindale.*

This has been incorporated in the *B.P.C.*

GUTTÆ CREOSOTI (*Squire*).—Creosote, 16 minims; Mucilage of Gum Acacia, 60 minims; Syrup of Orange, 1 fl. oz.; Water, to 2 fl. oz.; mix the Creosote with the Mucilage and add the other ingredients. One or two teaspoonfuls for a dose in an oz. of Milk.

MISTURA CREOSOTI (*Squire*).—Creosote, 16 minims; Almond Oil, ½ fl. oz.; Syrup of Orange, 1 fl. oz.; Powdered Gum Acacia, 1½ drm.; Water, to 8 fl. oz. Dissolve the Creosote in the Oil, mix it with the Powdered Gum Acacia in a mortar; add all at once 3 fl. drm. of Water, and triturate until an emulsion is formed, then add the remainder of the Water and the Syrup of Orange.

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.

PILULA CREOSOTI.—Creosote, 12 minims; Curd Soap, in powder, 6 grains; Liquorice, in powder, 30 grains; mix, and divide into 12 pills.

This has been incorporated by the *B.P.C.*

Foreign Pharmacopœias.—Official in Austr., Creosote 5, Yellow Wax 2·5, Liquorice 6, Extract of Liquorice 6, Mucilage of Acacia *q.s.*; Belg., Creosote 10, Water 2, Liquorice Root *q.s.*; Ger. and Jap., Creosote 10, Liquorice 19, Glycerin 1; Swiss, Creosote 5, Liquorice 9·5, Glycerin 0·5. Fr., Creosote with

Medicinal Soap *q.s.* Each pill contains 10 centigrammes of Creosote, 0·1 gramme (1½ grains).

SOLUTIO CREOSOTI COMPOSITA.—Creosote, 1; Spirit of Menthol (20 p.c.), 1; and Spirit of Chloroform, 1.—*Brompton.* Useful in an **oro-nasal inhaler.**

VAPOR CREOSOTI (*B.P.* 1885).—Creosote, 12 minims; Boiling Water, 8 fl. oz. Mix the Creosote and Water in a suitable apparatus, for inhalation.

This has been incorporated in the *B.P.C.*

Creosote, 80 minims; French Chalk, 30 grains; Water, to 1 oz. A teaspoonful in 20 oz. of Water at 140° F. for each inhalation.—*Throat.*

VASOLIMENTUM KREOSOTI.—Creosote, 5; Liquid Vasoliment, 95.—*Hager.*

Parogenum Creosoti.—Creosote, 5; Parogen, 95.—*B.P.C.*

VIN CRÉOSOTÉ.—Creosote 1, Alcohol (90 p.c.) 9, Simple Syrup 10, Malaga Wine 80.—*Fr.*

CREOSOTI CARBONAS (Creosotal).—A viscid, amber-coloured liquid, nearly odourless and tasteless; insoluble in Water. Not only useful in chronic diseases of the lung, but in acute diseases of the respiratory organs. It is stated to contain 90 p.c. of Creosote, and to be free from the irritating effects of that substance.—*B.M.J.E.* '96, i. 15; *L.* '97, ii. 1472.

One teaspoonful doses for adults, smaller doses for children.—*L.* '98, i. 222; this dose has been criticised, and 5 drops three times daily recommended.—*L.* '98, i. 960.

Is preferable to the Phosphate, though both are better than pure Creosote.—*B.M.J.* '01, ii. 219.

Teaspoonful doses morning and night, taken in a cup of hot sugared Milk in the treatment of acute broncho-pulmonary affections. The dosage for children is proportionately smaller. Has remarkable power of reducing temperature in bronchitis and pneumonia, and is beneficial even in advanced pneumonia. Administration best stopped gradually.—*L.* '99, ii. 710; *B.M.J.E.* '02, i. 4.

Foreign Pharmacopœias.—Official in Austr., Belg., Jap. and Swiss.

CREOSOTI OLEAS (Oleocreosote).—A light yellow, oily liquid, having a faint odour and taste of Creosote. Insoluble in Water, soluble in Absolute Alcohol and in Ether.

Dose.—15 to 30 grains = 1 to 2 grammes.

CREOSOTI PHOSPHAS (Phosphote).—A dense, oily substance, insoluble in Water.

Dose.—5 to 15 grains in capsules = 0·32 to 1 gramme.

CREOSOTI TANNAS (Tannosal).—A brown, hygroscopic powder, soluble in Water, in Alcohol (90 p.c.) and in Glycerin.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

CREOSOTI VALERIANAS (Eosote).—A yellow, oily liquid, distilling at 240° C. (464° F.), insoluble in Water, soluble in Alcohol (90 p.c.) and in Ether. Has been recommended as a substitute for Creosote on account of its freedom from corrosive and toxic properties. Commencing dose 3 grains, increasing to 6 or 9 grains three times a day, given in capsules.—*B.M.J.E* '96, ii. 59.

SALOCREOL (Creosote Salicylic Ester).—A brown, oily, neutral liquid, insoluble in Water, readily soluble in Alcohol (90 p.c.), in Ether and in Chloroform. It has been used in the treatment of rheumatic swelling of the joints.—*B.M.J.E.* '03, ii. 52.

Dose.—6 to 20 grammes rubbed into the skin.

Taphosote, the Tannophosphoric Ester, and **Phosphotal,** the Phosphite, are combinations of Phosphoric Acid and Creosote.

Pneumin, a compound of Creosote and Formaldehyde, is a yellow, tasteless, odourless powder. Insoluble in Water. Stated to have a beneficial effect in tuberculosis.

Dose.—7½ to 30 grains = 0·5 to 2 grammes.

CRETA PRÆPARATA.

PREPARED CHALK.

A purified native Calcium Carbonate, most of the impurities having been removed by elutriation.

Solubility.—Insoluble in Water, readily dissolved by weak acids.

Medicinal Properties.—It is astringent and antacid. Combined with other astringents and aromatics, it is used in infantile diarrhœa and in diarrhœa accompanied with acidity. One of the best antidotes for Oxalic Acid, the mineral acids, and Zinc Chloride. Used as a dusting powder in burns, ulcers, and moist eczema; it is protective and desiccant.

Dose.—10 to 60 grains = 0·65 to 4 grammes.

Prescribing Notes.—*Generally given in the form of Mistura Cretæ with astringent Tinctures and Opium.*

The Pulvis Cretæ Aromaticus is useful for administration to children, either in powder or in mixture with Mucilage.

Incompatibles. All Acids and Sulphates.

Official Preparations.—Mistura Cretæ, Pulvis Cretæ Aromaticus and Pulvis Cretæ Aromaticus cum Opio. Contained in Hydrargyrum cum Cretâ.

Not Official. Cholera Mixture, Pulvis Cretæ Compositus and Unguentum Cretæ.

Foreign Pharmacopœias.—Official in Hung., Jap., Port., Span. and U.S. Not in the others.

Tests.—Prepared Chalk is dissolved readily by dilute acids, effervescence occurring, with the evolution of a colourless and odourless gas, which affords a white precipitate when passed into Lime Water. A solution prepared by dissolving a portion of the sample in just sufficient Hydrochloric or Nitric Acid to effect solution, boiled and cooled, answers the tests distinctive of Calcium given under Precipitated Calcium Carbonate.

The more generally occurring impurities are siliceous material, Iron, Aluminium, Magnesium, Phosphates, Sulphates and Barium Carbonate. Siliceous material may be detected by the residue remaining insoluble in Hydrochloric Acid, preferably after evaporation of the acid solution to dryness and re-solution in diluted Hydrochloric Acid, and which should be relatively minute. Iron, Aluminium, Magnesium, Phosphates and Sulphates may be examined for by the tests given under Calcii Carbonas Præcipitatus, and should be present in but slight traces. Barium Carbonate, if present may be detected by dissolving a portion of the sample in Diluted Acetic Acid and adding Potassium Chromate Solution; a yellow precipitate insoluble in Acetic Acid, soluble in diluted mineral acids, indicates the presence of Barium.

Preparations.

MISTURA CRETÆ. CHALK MIXTURE.

Prepared Chalk, $\frac{1}{4}$ oz.; Tragacanth, in powder, 15 grains; Refined Sugar, $\frac{1}{2}$ oz.; Cinnamon Water, *q.s.* to make 8 fl. oz. (about 1 in 32)

Tragacanth is now used in place of Gum Acacia, and Sugar in place of Syrup.

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.

Foreign Pharmacopœias.—Official in Port., Carbonate of Lime 3, Gum Arabic 3, Syrup of Cinnamon 10, Water 84; U.S., Prepared Chalk 6, Acacia 4, Sugar 10, Cinnamon Water 40, Water, to measure 100. Not in the others.

PULVIS CRETÆ AROMATICUS. AROMATIC POWDER OF CHALK.

Prepared Chalk, 11; Cinnamon, 4; Nutmeg, 3; Cloves, 1½; Cardamom Seeds, 1; Refined Sugar, 25; all in powder.

(about 1 Chalk in 4⅐)

Saffron is now omitted.

Dose.—10 to 60 grains = 0·65 to 4 grammes.

PULVIS CRETÆ AROMATICUS CUM OPIO. AROMATIC POWDER OF CHALK WITH OPIUM.

Aromatic Powder of Chalk, 39; Opium, in powder, 1.

(1 Opium in 40)

Dose.—10 to 40 grains = 0·65 to 2·6 grammes.

Not Official.

CHOLERA MIXTURE.—Aromatic Powder (*B.P.* '64), 3 drm.; Spirit of Sal Volatile, 3 fl. drm.; Tincture of Catechu, 10 fl. drm.; Compound Tincture of Cardamoms, 6 fl. drm.; Tincture of Opium, 1 fl. drm.; Chalk Mixture, to make 20 fl. oz.

Dose.—1 fl. oz. = 28·4 c.c. for an adult, ½ fl. oz. = 14·2 c.c. for a child 12 years old, ¼ fl. oz. = 7·1 c.c. for seven years old, after each liquid motion.

This mixture was proposed by the Board of Health during the prevalence of cholera, and is useful in cases of diarrhœa.

A mixture much like this has been introduced into the *B.P.C.* under the title **Mistura Cretæ Composita** with the *synonym* **Board of Health Cholera Mixture** as follows:—

Compound Aromatic Powder, 2; Aromatic Spirit of Ammonia, 1·875; Tincture of Catechu, 6·25; Compound Tincture of Cardamoms, 3·75; Tincture of Opium, 0·625; Chalk Mixture, *q.s.* to produce 100.

PULVIS CRETÆ COMPOSITUS.—Prepared Chalk, 30; Acacia, in fine powder, 20; Sugar, in fine powder, 50.—*U.S.P.*

This has been incorporated in the *B.P.C.*

UNGUENTUM CRETÆ.—Prepared Chalk, 1; Spermaceti Ointment, 4; mix.

CROCUS.

SAFFRON.

FR., SAFRAN; GER., SAFRAN; ITAL., ZAFFERANO; SPAN., AZAFRAN.

The dried Stigmas and tops of the Styles of *Crocus sativus*.

Imported from Spain, France, and Italy.

The important ingredient of Saffron is Crocin or Polycroit, a body of a glucosidal nature stated by Hilger and Schuler to be identical with Carotin. It also contains a small percentage from 0·75 to 1·0 p.c. of Volatile Oil and Picrocrocin, in addition to Wax, Gum, Albumen, saline matter, Water, and Lignin.

Medicinal Properties.—Useful for giving colour and flavour to preparations.

Official Preparation.—Tinctura Croci. Used in the preparation of Decoctum Aloes Compositum and Tinctura Cinchonæ Composita.

Not Official.—Glycerinum Croci and Syrupus Croci.

Foreign Pharmacopœias.—Official in all except U.S.; Dutch, Stigmata Croci; Mex., Azafran; Port., Açafrao; Dan., Norw. and Swed., Stigma Croci.

Descriptive Notes.—Saffron consists of the upper part of the trifid style, and stigmas of *Crocus sativus*, L. It is of an orange-red colour and is usually about one inch or more in length, the stigmatic portion being slightly dilated, nearly tubular above, slit on the under side, and toothed at the apex. In commerce it is frequently adulterated; no drug more so. The best and purest commercial variety is that from Valencia; the Saffron of Alicante, and particularly of Barcelona, being often adulterated. The stamens of the flower are sometimes present in more than accidental amount, and are even sometimes offered separately in the drug market as 'yellow saffron.' They are linear and arrow-shaped at the base, inserted on a short filament. The florets of *Calendula officinalis*, L., are seen to be flat and pale in colour, and the roots of *Carex* thread-like. Saffron normally retains about 12½ p.c. of moisture (12 p.c., *P.G.*), and should therefore be kept in a tin, or loss of weight may ensue. The fresh crop is usually obtainable in commerce in November and December.

The florets of *Carthamus tinctorius*, L. (nat. ord. *Compositæ*), sold in small flat cakes, are sometimes offered as 'Cake Saffron.' The florets are saffron-coloured, tubular, and contain syngenesious anthers.

Under the name of Cape Saffron the flowers of *Lyperia crocea*, Eckl. (nat. ord. *Scrophulariaceæ*), are at rare intervals offered in the drug market. It is a native of the Cape of Good Hope.

Tests.—Saffron yields an intensely yellow solution when treated with Water, and when rubbed on the wet finger leaves an orange-yellow stain. The *P.G.* states that 100,000 parts of Water shaken with 1 part of Saffron assume a pure and distinct yellow colour. When brought into contact with a drop of Sulphuric Acid it yields a deep indigo-blue coloration.

The more generally occurring adulterations of Saffron are excess of moisture, mineral matter, *e.g.*, Barium Sulphate, Sand, etc., fixed oils, stamens artificially dyed so as to resemble stigmata, Safflower, Nitrates, due to the presence of artificial colouring matter derived from Nitrophenols or Nitrocresols, principally the latter. The limit of moisture is fixed by the *B.P.* at not more than 12·5 p.c., by the *P.G.* at not more than 12 p.c. Mineral matter may be detected by the residue left on ignition, or by a deposit of white or coloured powder settling out when the sample is floated on the surface of some warm Water. The finest Saffron yields, when ignited with free access of air, from 4·4 to 5·5 p.c. of ash. The *B.P.* limit is about 7·0 p.c., that of the *P.G.* calculated on dried sample 6·5 p.c., which is equivalent to 7·4 p.c. on the undried Saffron. The ash should be examined for Barium.

The ash is considered (*C.D.* '02, i. 148) to be of little use to the buyer of Saffron unless he has experience as well to help him; a poor, thin, semi-wild variety of Saffron may give an excellent ash, possibly not over 4 p.c., whilst a fine bold quality which has been dressed to a very moderate extent will be outclassed by yielding over the *B.P.* maximum.

Fixed oils may be detected by the greasy spot produced when the sample is pressed between folds of white bibulous paper; artificially dyed products by the Sulphuric Acid test after extraction with Petroleum Ether, which extracts the colour derived from Coal Tar products but not that of genuine Saffron. Safflower yields an Infusion which is coloured greyish-green by Ammonia Solution and a bright red by Nitric Acid. Colouring matters derived from Nitrophenols or Nitrocresols may be detected by deflagration occurring during incineration, or by dissolving the ash in Water and applying the Ferrous Sulphate test for Nitrates. The colouring powers of different specimens of Saffron may be judged by comparison with a standardised Potassium Bichromate Solution.

Preparation.

TINCTURA CROCI. TINCTURE OF SAFFRON.

1 of Saffron, macerated with 20 of Alcohol (60 p.c.). (1 in 20)

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Foreign Pharmacopœias.—Official in Span., 1 in 5; Belg., Jap. and Swiss, 1 in 10; all by weight. Not in the others.

Tests.—Tincture of Saffron has a specific gravity of 0·920 to 0·925; contains from 2·0 to 3·0 p.c. w/v of total solids and from 57 to 58 p.c. w/v of Absolute Alcohol. A few drops of the Tincture evaporated to dryness in a white porcelain dish on a water-bath leave a residue which when cooled yields an indigo-blue coloration with a drop of concentrated Sulphuric Acid.

Not Official.

GLYCERINUM CROCI (*Squire*).—Saffron, 1; Glycerin, 20; Alcohol (60 p.c.), 20; mix the Glycerin and the Alcohol, and digest in it the Saffron for an hour at a gentle heat, and filter. This is introduced as a substitute for **Syrupus Croci,** which deposits and loses its colour.

This has been incorporated in the *B.P.C.*

SYRUPUS CROCI (*Squire*).—Glycerin of Saffron, 1; Syrup, 7.

This has been incorporated in the *B.P.C.*

CROTONIS OLEUM.

CROTON OIL.

FR., HUILE DE CROTON; GER., KROTONOL; ITAL., OLIO DI CROTONTIGLIO; SPAN., ACEITE DE CROTON TIGLIO.

A yellow, brownish-yellow, or reddish-brown, somewhat viscid, slightly fluorescent, oily liquid, possessing an unpleasant odour and an acid and burning taste. It is the Oil expressed from the seeds of *Croton Tiglium*, L.

It consists chiefly of the Glycerides of Stearic, Palmitic, Myristic, Lauric, and Oleic Acids. It also contains the Glycerin Esters of Formic, Acetic, Isobutyric, and Isovalerianic Acids, together with Tiglic Acid, Crotonoleic Acid, a toxic albuminoid, Crotin, and Croton-resin, the latter lactone possessing powerful vesicant properties.

A native of Hindostan, Ceylon, and the Moluccas.

100 of seed yield about 50 of Oil.

Solubility.—Soluble in Ether, Oil of Turpentine, and Olive Oil; partially soluble in Alcohol (90 p.c.).

B.P. 1898 still retains the sentence, 'entirely soluble in Absolute Alcohol,' although it has been repeatedly pointed out that this is not strictly the case. An oil recently expressed will dissolve the Absolute Alcohol up to equal parts, but when more than one volume of Alcohol is added to one of Oil the mixture becomes turbid, and with two volumes of Alcohol the mixture separates into two layers on standing. With a sample of oil two or three years old rather more Alcohol can be added without the mixture becoming turbid, but it is only a question of degree.

The solubility of Croton Oil in Absolute Alcohol appears to depend in great measure on the age of the Oil, and the greater or less freshness of the seeds from which it is expressed, as oxidised or resinified Oil dissolves more readily.

The solubility of the Oil as a whole depends upon the proportion of free Acid, which is very soluble in Alcohol, and also carries the difficultly-soluble neutral Glyceride into solution along with it.

Croton Oil can be separated by Alcohol into two parts. The non-vesicating portion insoluble in Alcohol possesses the full purgative properties of the Oil in a less irritating form; the alcohol-soluble or vesicating portion had no purgative action in the same doses, but caused irritation and nausea.

Medicinal Properties.—A powerful drastic cathartic, acting with great rapidity. Given in cases of obstinate constipation, in dropsy, in apoplexy, in maniacal and unconscious patients, and in eclampsia, its small dose being an advantage. Applied externally as a powerful counter-irritant in rheumatism, gout, neuralgia, and in acute laryngeal and pulmonary diseases in the form of **liniment**. Its external application is painful, and is often followed by an inflammatory eruption which becomes pustular, and leaves unsightly scars. It is therefore not often used externally, unless well diluted.

Croton Oil must be given with great care, and is inadmissible in feeble subjects, in organic obstruction, and in inflammatory states of the stomach and intestines.—*Mitchell Bruce.*

It should never be given to children, to pregnant women, to those with hæmorrhoids, nor to those suffering from peritonitis.—*Hale White.*

5 minims to 1 fl. oz. of Olive Oil are used to promote the growth of hair.

Dose.—½ to 1 minim = 0·03 to 0·06 c.c.

Ph. Ger. maximum single dose, 0·05 gramme; maximum daily dose, 0·15 gramme.

Prescribing Note.—*In pill with Soap and Liquorice Powder (see p. 897), or in combination with Compound Extract of Colocynth.*

Official Preparation.—Linimentum Crotonis.

Not Official.—Croton Oil Pencils and Collodium Tiglii.

Antidotes.—In case of an overdose an emetic should be at once administered, the stomach should be washed out with Olive Oil or Milk, 4 fl. oz. to pint of Water; mucilaginous fluids and Opium or Morphine should then be given to check the pain and enteritis.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex. (Aceite de Croton Tiglio), Norw., Port., Russ., Span., Swed., Swiss and U.S. (Oleum Tiglii). Swed. has also an Oleum Crotonis Extractum.

Tests.—Croton Oil has a specific gravity of 0·940 to 0·960, which limits are given by both the *B.P.* and the *P.G.*; the *U.S.P.* gives 0·935 to 0·950 at 25° C. (77° F.). It should be slightly dextrogyrate. It possesses an Acid value of 21 to 22, a Saponification value of 203 to 215, and an Iodine absorption of not less than 105·0 p.c. A sample of the fresh oil examined in the author's laboratory had an Acid value of 24·36, an Ester value of 176·4, a Saponification value of 200·76; a sample dated 1906 had an Acid value of 20·9, an Ester value of 179·2, a Saponification value of 200·1, and an Iodine value of 106·68; a sample dated 1900 had an Acid value of 48·72, an Ester value of 149·8, and a Saponification value of 198·52. The solidifying point of the fatty acids ranges from 16·5° to 16·8° C. (61·7° to 62·24° F.). The *B.P.* refers to the specific gravity, and states that the alcoholic solution should not redden blue Litmus paper, but makes no reference to the other physical and chemical characteristics of the oil.

Croton Oil may be detected in mixtures by shaking with an Alcoholic Potassium Hydroxide solution, separating the alcoholic layer, acidifying with dilute acid and removing the spirit by distillation. The residue is shaken with Ether, the ethereal solution separated, the Ether distilled and the residue tested on the skin. A characteristic pustular eruption should be produced if Croton Oil be present.

The more generally occurring impurities are 'other non-drying oils.' These are detected by vigorously shaking a measured quantity of 2 c.c. of the oil with a mixture of 1 c.c. of fuming Nitric Acid and 1 c.c. of Water, after standing for one or two days the mixture should neither partially nor completely solidify. The test is common to the *B.P.*, *U.S.P.* and *P.G.*

Saponification.—The *U.S.P.* requires that Croton Oil should show a Saponification value of from 203 to 215 when saponified by Alcoholic T.S. of Potassium Hydroxide.

Iodine Absorption.—If 0·3 gramme of Croton Oil be dissolved in 10 c.c. of Chloroform in a 250 c.c. bottle or flask, and 25 c.c. of a mixture of equal volumes of Alcoholic Iodine T.S. and Alcoholic Mercuric Chloride T.S. added, and if after standing for 4 hours protected from light 20 c.c. of Potassium Iodide T.S. be added and the mixture diluted with 50 c.c. of Water, on titrating the excess of Iodine with Tenth-normal V.S. of Sodium Thiosulphate, an Iodine value of not less than 103 nor more than 109 should be obtained, *U.S.P.*

Preparation.

LINIMENTUM CROTONIS. Liniment of Croton Oil.

Croton Oil, 1; Oil of Cajuput, 3½; Alcohol (90 p.c.), 3½. (1 in 8)

Brompton and *St. Mary's* have a diluted liniment made with equal parts of the Official Preparation and Liniment of Soap.

Not Official.

CROTON OIL PENCILS.—Croton Oil, 2; Cacao Butter, 1; White Beeswax, 1; melt together the last two in a water-bath, add the Oil, and when nearly cold pour into moulds.

COLLODIUM TIGLII.—Croton Oil, 1; Flexile Collodion, 9.—*U.S.N.F.*

CUBEBÆ FRUCTUS.

CUBEBS.

Fr., Cubèbe; Ger., Kubeben; Ital., Pepe Cubebe; Span., Cubeba.

The dried, full-grown, unripe Fruits of *Piper Cubeba.*

Medicinal Properties.—Stimulant and antiseptic diuretic, expectorant. Acts specially on the genito-urinary mucous membrane. Given in all stages of gonorrhœa, gleet, cystitis, pyelitis, and sometimes in chronic bronchitis. Frequently combined with Copaiba.

Dose.—30 to 60 grains = 2 to 4 grammes.

Prescribing Notes.—*The Powder is given in the above doses wrapped in moistened wafer-paper, or in smaller doses in* **cachets.** *In* **mixture** *well rubbed down with Mucilage. A popular form of administration is the* **paste,** *made with an equal quantity of Copaiba, which may be taken in wafer-paper. It is also made into a paste with Glycerin and various Syrups. For throat affections, Lozenges, Compressed Tablets, and Cigarettes are made. It is also given in the form of Vapour.*

The **Oil** *is given in Capsules or suspended in Water with Mucilage.*

For Inhalation the Oil may be used with or without the vapour of Water.

Official Preparations.—Oleum Cubebæ and Tinctura Cubebæ.

Not Official.—Extrait de Cubèbe, Fluidextractum Cubebæ, Oleo-resina Cubebæ, Trochiscus Cubebæ, Vapor Cubebæ and Vapor Cubebæ cum Limone.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Descriptive Notes.—Cubebs vary much in quality, and when scarce and dear are often adulterated, or other species are substituted for them. The official kind should be about $\frac{1}{6}$ inch (4 mm.) in diameter and vary from nearly black to greyish-brown in colour, the pericarp being wrinkled, and furnished with a slender rounded pedicel about $1\frac{1}{2}$ times as long as the fruit and continuous with it (4 to 10 mm., *P.G.*). The pericarp contains a single seed attached to the base of the ovary. The taste is warm and aromatic and slightly bitter. These characters are, however, not sufficient to distinguish the genuine from the false fruits frequently offered in commerce. The most reliable characters, adopted in the *B.P.* are: (1) the crimson colour developed when a crushed Fruit is covered with a drop or two of Sulphuric Acid, since the spurious Cubebs hitherto met with apparently do not contain Cubebin and Cubebic Acid, to which the reaction is due; (2) in the Powdered Fruit, the radially elongated cells of the inner surface of the pericarp. Three varieties of the plant are cultivated in Java. The Fruit of two of them give the crimson reaction with Sulphuric Acid, but the Fruit Stalk of one is longer than that of the other; the third kind has an odour recalling that of Nutmegs, it does not give the crimson reaction, and has caused symptoms of poisoning when administered, *see P.J.* (3), xxv. pp. 314, 757, 797.

When Cubebs are scarce they are adulterated with Fruits similar in form, such as *Rhamnus* species, which is a 3- to 4-celled Fruit; *Briedelia montana*, Willd., and *Litsea citrata*, Bl., which have a large exalbuminous embryo, whilst that of *Piper Cubeba* is minute and embedded in the apex of a large oily albuminous perisperm.

Other species of Piper Fruits are sometimes substituted for Cubebs, *e.g.*, *Piper ribesoides*, Wall., *P. crassipes*, Korth., and *P. Lowong*, Bl., but these are either larger than Cubebs or are different in flavour, and do not give the crimson reaction with Sulphuric Acid.

The quality of genuine Cubebs depends upon freedom from stalks, and from immature hollow Fruits, which are concave at the base, since the stalks or rachis contain less Oil, and the Seed contains more, than the pericarp. Usually the stalks are sold separately, and employed for the distillation of Oil of Cubebs.

Tests.—Cubebs when crushed and tested with Sulphuric Acid impart a crimson colour to the Acid. No limit of ash is given in the *B.P.*; it should not exceed 7·0 p.c.

An Oleo-resin extractable by Ether and by Alcohol (90 p.c.) is present in the Fruits, to the extent of from 17 to 25 p.c. A limit of 22·0 p.c. has been suggested (*C.D.* '02, ii. 826) as a standard for inclusion in the official monograph, dry chemically pure Ether being suggested as a solvent. Ether was employed as a solvent in the 1890 Edition of the *U.S.P.*, but was altered to Alcohol (94·9 p.c.) in the 8th Decennial Revision. A standard of not less than 17·0 p.c. has also been suggested.

Preparations.

OLEUM CUBEBÆ. Oil of Cubebs.

A viscid, oily liquid, possessing a characteristic odour and a warm camphoraceous taste.

B.P. describes it as colourless, pale green, or greenish-yellow; Schimmel, as light green, or bluish-green; it is colourless only when the last portions of the distillation, which are blue, have not been added to the product.

It is distilled from Cubebs, the yield being from 10 to 18 p.c.

It consists almost entirely of Terpenes or Sesquiterpenes. It contains a lævogyrate Terpene, Pinene, Dipentene; a lævogyrate Sesquiterpene, Cadinene; and a lævogyrate Sesquiterpene Alcohol, Cubeb-camphor, which is found only in old Oil.

Solubility.—1 in 18 of Alcohol (90 p.c.), in all proportions of Absolute Alcohol.

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

Foreign Pharmacopœias.—Official in Port., sp. gr. 0·929; U.S., sp. gr. 0·905 to 0·925 at 25° C. (77° F.). Not in the others.

Tests.—Oil of Cubebs has a specific gravity of from 0·915 to 0·930; the *U.S.P.* gives 0·905 to 0·925 at 25° C. (77° F.); the *B.P.* 0·910 to 0·930. It has an optical rotation of −25° to −40° in a 100 mm. tube. The greater portion of the Oil distils between 250° and 280° C. (482° and 536° F.), about 10 p.c. passing over below 250° C. (482° F.). The Oil is stated to be soluble in from 1 to 3 volumes of Alcohol (90 p.c.), and to afford a solution which is neutral to Litmus paper. The solubility in Alcohol (90 p.c.) varies greatly according to the age of the sample, old Oils being apparently more soluble than new Oils. The Oil is not often adulterated. Turpentine Oil if present would be detected by the behaviour of the Oil on fractionation.

TINCTURA CUBEBÆ. Tincture of Cubebs.

4 of Cubebs, percolated with Alcohol (90 p.c.), to yield 20. (1 in 5)

Dose. ½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Mex., 1 in 5, by weight. Not in the others.

Tests.—Tincture of Cubebs has a specific gravity of about 0·840; contains about 2·0 p.c. w/v of total solids and about 86·0 p.c. w/v of Absolute Alcohol.

Not Official.

EXTRAIT DE CUBÈBE—1 of Cubebs, in No. 22 powder, percolated first with 2 of Ether, and subsequently with 2 of Alcohol (95 p.c.); evaporate the two liquids separately and mix the resulting extracts.—*Fr.*

FLUIDEXTRACTUM CUBEBÆ.—Cubebs, in No. 40 powder, 100 grammes, percolated with Alcohol (95 p.c. by vol.) until the Cubebs are exhausted, reserve the first 90 c.c. of percolate, and evaporate the remainder to a soft extract; dissolve this in the reserved portion, and add sufficient Alcohol to make 100 c.c. —*U.S.P.*

This has been incorporated in the *B.P.C.*

Dose.—5 to 30 minims = 0·3 to 1·8 c.c.

OLEO-RESINA CUBEBÆ. *Syn.* Extractum Cubebæ.—Percolate Cubebs in coarse powder with Ether, slowly, until the liquor passes colourless. Let the Ether evaporate from the liquor, at first spontaneously and then over a water-bath, or recover it by distillation; and transfer the residue to a closed vessel, letting it stand until waxy or crystalline matter ceases to be deposited. Decant the Oleo-resin and preserve it in a well-stoppered bottle.

This was official in *B.P.* 1885, and has been incorporated in the *B.P.C.*

Dose.—5 to 30 minims = 0·3 to 1·8 c.c.

Foreign Pharmacopœias.—Official in Fr., Ger., Hung., Jap., Mex. (Extracto Alcoholico de Cubebas), Swiss and U.S. Not in the others.

TROCHISCUS CUBEBÆ.—Each lozenge contains about ½ grain of Cubebs with Fruit Paste.—*Throat.*

This has been incorporated in the *B.P.C.*

Official in U.S., about ½ grain of Oleo-resin in each.

VAPOR CUBEBÆ.—Oil of Cubebs, 40 minims; Light Magnesium Carbonate, 20 grains; Water, to 1 fl. oz. Mix. A teaspoonful in a pint of Water at 140° F. for each inhalation.—*Throat.*

This has been incorporated in the *B.P.C.*

VAPOR CUBEBÆ CUM LIMONE.—Oil of Cubebs, 30 minims; Oil of Lemons, 10 minims; Light Magnesium Carbonate, 20 grains; Water, to 1 oz.—*Throat.*

Not Official.

CUCURBITÆ SEMINA PRÆPARATA.

MELON PUMPKIN SEEDS.

The prepared fresh ripe Seed of *Cucurbita maxima*, from cultivated plants are official in the *Ind.* and *Col. Add.* for the Mediterranean Colonies.

Dose.—3 to 4 oz. = 85·2 to 113·6 grammes.

Not Official.

CUPRI SUBACETAS.

Syn.—ÆRUGO. VERDIGRIS.

Pale green powder, or partly crystalline masses.

According to Von Hager two varieties are recognised commercially: the blue or French Verdigris, consisting chiefly of monobasic Copper Acetate, $Cu(C_2H_3O_2)_2 + Cu(OH)_2 + 5H_2O$, and the green, or English, German, or Swedish variety, consisting chiefly of semi-basic Copper Acetate $[Cu(C_2H_3O_2)_2] + Cu(HO)_2 + 5H_2O$, as well as some bibasic Copper Acetate $Cu(C_2H_3O_2)_2 + 2Cu(HO)_2 + H_2O$.

Solubility.—When treated with Water about 50 p.c. dissolves as Copper Acetate, leaving an insoluble Acetate; insoluble in Alcohol (90 p.c.); soluble in diluted mineral acids and in Acetic Acid; also soluble in Ammonia.

Medicinal Properties.—Used as a stimulant to foul and indolent ulcers, also as an escharotic.

Foreign Pharmacopœias.—Official in Belg., Mex. (Acetato de Cobre bibasico), Port. (Verdete), and Span. (Cardenillo). Not in the others.

Tests.—Copper Subacetate answers the tests for Copper appearing under Copper Sulphate. When warmed with Sulphuric Acid and a little Alcohol (90 p.c.), the distinctive odour of Ethyl Acetate is evolved; when warmed with a minute amount of Arsenious Anhydride, the characteristic and highly-poisonous odour of Cacodyl Oxide is evolved. It should dissolve almost completely in Ammonia Solution.

The more generally occurring impurities are Arsenic, metallic Copper, Aluminium, and Chalk. Arsenic may be detected by Bettendorf's test; metallic Copper and Aluminium from the residue insoluble in Ammonia Solution; and Chalk by the effervescence on the addition of Hydrochloric Acid. Copper Sulphate, if present, may be detected by the addition of Barium Chloride solution.

LINIMENTUM ÆRUGINIS (*Ph. Lond.*).—Made by dissolving Verdigris 1, in Vinegar 7, adding Honey 14, and boiling down to a proper consistence.

This has been incorporated in the *B.P.C.*

MELLITE CUIVREUX (Onguent Ægyptiac) (*Fr.*).—Copper Acetate, 1; Water, 1; Honey, 2. Boil until it assumes a red colour, and is the consistence of honey.

OXYMEL DE VERDETE (*Port.*).—Verdigris, 2; Vinegar, 3; Honey, 5. Boil down to a proper consistence.

TOPIQUE À L'ACÉTATE DE CUIVRE (VET.).—Copper Acetate, 4; Treacle, 1; Vinegar, 1; mix.—*Fr.*

CUPRI ACETAS.—Deep green or bluish-green, prismatic crystals.

Solubility.—1 in 15 of Water, 1 in 300 of Alcohol (90 p.c.), 1 in 112 of Glycerin.

Medicinal Properties.—Similar to the Subacetate, but more definite when required for solution in Water.

Foreign Pharmacopœias.—Official in Fr.

Tests.—Copper Acetate yields a bluish-green coloured solution which changes to a deep blue on the addition of Ammonia Solution in excess. It should respond to the tests for Copper given under Copper Sulphate. A small portion of the salt warmed with Sulphuric Acid evolves a characteristic acetous odour. When warmed with Sulphuric Acid and a little Alcohol (90 p.c.) the odour of Ethyl Acetate is given off.

The more generally occurring impurities are Arsenic, Iron, Lead and Zinc, alkalis and alkali earths. Arsenic may be detected by Bettendorf's test; Lead and Zinc by boiling an aqueous solution with an excess of Sodium Hydroxide Solution, cooling, filtering, and passing Hydrogen Sulphide into the filtrate, no cloudiness or precipitate should be produced; Iron, alkalis and alkali earths by removing the Copper as Sulphide with Hydrogen Sulphide, filtering and evaporating the filtrate to dryness, no residue should remain.

CUPRI SULPHAS.

COPPER SULPHATE.

B.P.Syn.—Cupric Sulphate.

$CuSO_4,5H_2O$, eq. 247·86.

Fr., Sulfate de Cuivre; Ger., Kupfersulfat; Ital., Solfato di Rame; Span., Sulfato Cuprico.

Large, translucent, blue, triclinic crystals, possessing a metallic and astringent taste. It slowly effloresces in dry air.

It may be obtained by the action of Water and Sulphuric Acid on Copper or by dissolving Copper Oxide in Sulphuric Acid.

When rendered anhydrous by heating the powder is white.

Solubility.—1 in 3½ of Water, 2 in 1 of Water (at 212° F.); insoluble in Alcohol (90 p.c.); 1 in 2½ of Glycerin.

Will not dissolve 1 in 2·75, as stated by some authorities.—*P.J.* '02, i. 553.

Medicinal Properties.—Astringent, prompt emetic, escharotic. Recommended in chronic diarrhœa, especially that of phthisis. Externally, as a styptic for bleeding surfaces and a local stimulant to ulcers, as an escharotic for warts, etc. For **lotions**, in proportions from 2 to 4 grains to 1 oz.; also 8 grains to 1 oz. for prurigo. As an astringent, **injection** to diminish excessive secretion from mucous membranes, especially in leucorrhœa and gonorrhœa. For urethral **injections**, 1 to 4 grains in an oz. of Water. It is also used 1 to 2 grains to 1 oz., in granular conjunctivitis and various affections of the eyes when astringent applications are required.

An antidote in Phosphorus poisoning—3 grains every few minutes till vomiting is produced.—*Mitchell Bruce.*

Copper Sulphate 10 grains, Tincture of Opium 60 minims, Water 4 fl. oz. This was used as a rectal injection in a bad case of dysentery.—*L.* '89, ii. 739.

Recommendation of the Departmental Committee appointed to inquire into the use of preservatives and colouring matter in food. That the use of Copper salts in the so-called greening of preserved food be prohibited.—*L.* '01, ii. 1683; *J.S.C.I.* '01, 1228.

Dose.—As an astringent, ¼ to 2 grains = 0·016 to 0·13 gramme; as an emetic, 5 to 10 grains = 0·32 to 0·64 gramme.

Ph. Ger. maximum single dose, 1·0 gramme.

Prescribing Notes.—*Best given in form of pill. A good pill is prepared by adding ⅓ part of Pulvis Tragacanthæ Compositus, and Dispensing Syrup, q.s.; varnish if required.*

Incompatibles.—Alkalis and their Carbonates, Lime Water, Iodides, and most vegetable astringents.

Not Official.—Guttæ Cupri Sulphatis, Cupri Oleas, Unguentum Cupri Oleatis, Lapis Divinus (Cuprum Aluminatum), Fehling's Solution, Pavy's Solution, Cuprargol, and Cupri Sulphocarbolas.

Antidotes.—In case of poisoning by Copper Sulphate, Albumen or White of Egg is the best antidote; the stomach should then be washed out, demulcent drinks given, followed by Laudanum internally or Morphine hypodermically, and Linseed Meal poultices applied to the abdomen.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital. (Solfato di Rame), Jap., Mex. (Sulfato de Cobre), Norw., Port., Russ., Span., Swed., Swiss and U.S.

Ger. and Swiss have also a **crude sulphate.**

Tests.—Copper Sulphate dissolves in Water, yielding a solution which has an acid reaction towards Litmus paper, and which with Hydrogen Sulphide produces a brownish-black precipitate insoluble in Diluted Hydrochloric Acid and in Ammonium Hydrosulphide or Potassium or Sodium Hydroxide Solution, but soluble in Nitric Acid. A similar precipitate is yielded by Ammonium Hydrosulphide Solution. Ammonia Solution added drop by drop to an aqueous solution produces at first a pale blue precipitate which dissolves in an excess of the reagent yielding an intensely blue-coloured solution; Potassium or Sodium Hydroxide Solution gives a somewhat similar precipitate, which becomes brownish-black on boiling. The light blue precipitate is soluble in a very large excess of concentrated Potassium or Sodium Hydroxide Solution, but the presence of a soluble Tartrate prevents the precipitation, a deep blue liquid being produced which readily undergoes reduction to red Cuprous Oxide on boiling with Glucose and some Sugars. Potassium Hydroxide Solution produces no precipitate, but only a deep blue-coloured solution, when a fixed organic acid is present. Ammonium Carbonate Solution yields a greenish-blue precipitate soluble to a deep blue solution in an excess of Ammonia Solution. Potassium Ferrocyanide Solution yields a reddish-brown precipitate insoluble in dilute mineral acids, but decomposed by Potassium or Sodium Hydroxide Solution. A strip of bright metallic Iron immersed in a solution acquires a reddish coating of metallic Copper. A solution of Copper Sulphate acidified with diluted Hydrochloric Acid yields on the addition of Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid.

The more generally occurring impurities are Arsenic, Aluminium, Iron, Lead, and Zinc. Arsenic may be detected by the Bettendorf's test; Iron, Aluminium, and Zinc by removing the Copper from an acidified solution with Hydrogen Sulphide, adding Ammonia Solution to one portion and evaporating the other to dryness, in the former case no turbidity should be produced, in the latter no residue should remain. Their presence may also be ascertained by removing the Copper as oxide by boiling with Potassium or Sodium Hydroxide Solution and examining the filtrate (after acidification with Acetic Acid) by the time-limit test for heavy metals.

Heat.—When heated, Copper Sulphate loses its Water of crystallisation; two molecules are lost at 30° C. (86° F.) with the formation of a pale blue amorphous powder, another two are lost at 100° C. (212° F.), and the last molecule is given up at a temperature of 200° C. (392° F.), leaving an anhydrous powder weighing 63·9 p.c. of its original weight. At a still higher temperature Sulphur Dioxide and Oxygen are given off, leaving a residue of Cupric Oxide, *U.S.P.*

Hydrogen Sulphide.—If to an aqueous solution of 0·5 gramme of Copper Sulphate an excess of Hydrogen Sulphide T.S. be added and the precipitate produced filtered off, the colourless filtrate after the addition of T.S. of Ammonia should remain colourless, and after evaporation should not leave a weighable residue, *P.G.*

If Hydrogen Sulphide gas be passed through 10 c.c. of an aqueous solution (1–20) of the salt, to which 1 c.c. of diluted Hydrochloric Acid has been previously added, until precipitation of Copper Sulphide is complete, one half of the colourless filtrate should not be coloured or rendered turbid on the addition of T.S. of Ammonia, nor should the other half yield a weighable residue when evaporated and ignited, *U.S.P.*

Time-limit Test.—An aqueous solution of the salt (1-20) when boiled with excess of T.S. of Sodium Hydroxide until the Copper Oxide is completely precipitated, and then filtered, a colourless filtrate should be obtained which, acidulated with Acetic Acid, should not respond to the time-limit test for heavy metals, *U.S.P.*

Not Official.

GUTTÆ CUPRI SULPHATIS.—Copper Sulphate, 2 grains; Water, 1 fl. oz.—*London Ophthalmic.* The strength in use at the principal hospitals.

CUPRI OLEAS.—Green, oleaginous solid, insoluble in Water, soluble in Ether. An excellent antiseptic and antiparasitic agent. When diluted it is especially useful in ringworm.

UNGUENTUM CUPRI OLEATIS.—Copper Oleate, 1; Lard, 4; melt together, and stir till cold. Useful in ringworm, hard and horny warts, corns and bunions.—*B.M.J.* '84, ii. 752.

1 to 7 of Soft Paraffin (*London*); 1 to 7 of Lard (*University*); 1 to 9 of Lard (*B.P.C.*).

LAPIS DIVINUS. CUPRUM ALUMINATUM.—Copper Sulphate, Potassium Nitrate, and Alum, of each equal parts, in powder, fused in a glazed earthen crucible, powdered Camphor, to the extent of $\frac{1}{50}$th part of the whole, being added near the end of the process. When cold, break in pieces and keep in a closely stoppered bottle. An **eye-wash** may be made by dissolving 2 grains in 1 oz. of Distilled Water.

Foreign Pharmacopœias.—Official in Fr. (Pierre Divine), Ger., Hung., Jap., Russ. and Swiss. Not in the others.

FEHLING'S SOLUTION.—*See* Appendix.

PAVY'S SOLUTION.—Crystallised Copper Sulphate, 34·65 grammes; Rochelle Salt, 170 grammes; Potassium Hydroxide, 170 grammes; Water, to 1000 c.c.

When 120 c.c. of this Solution are mixed with 400 c.c. of Ammonia (sp. gr. 0·880) and diluted to 1000 c.c., then 10 c.c. may be taken as equivalent to 0·005 gramme of Glucose.

The method is well adapted for the examination of Diabetic Urine and Milk, also mixtures of Milk and Cane Sugars, and certainly has the advantage over the ordinary Fehling method by its definite end reaction.

CUPRARGOL (Copper and Silver Albuminate).—A greyish-white powder, soluble in Water. Has been used in 1 to 5 p.c. solution in conjunctivitis.

CUPRI SULPHOCARBOLAS (Copper Aseptol).—Green rhombic prisms or light green needle-shaped crystals. Soluble in Water and in Alcohol (90 p.c.). Hæmostatic. As an antiseptic, ½ to 1 p.c. solution. As an injection in gonorrhœa, ¼ to 1½ p.c. solution.

Not Official.

CURARA—WOORARA.

A powerful poison, stated to be obtained from various species of *Strychnos* and other plants, and used by the Indians in the northern part of South America for arming the points of their arrows. A brownish-black, shining, brittle, resinous mass, almost wholly soluble in Water, sparingly soluble in Absolute Alcohol. Different samples may vary very much in strength, and no doubt also in general composition, so that the dose of every parcel has to be arrived at by experiment. It is only used **hypodermically,** and the **solution** has generally been of the strength of 1 grain in 12 minims.

An alkaloid **Curarine** has been obtained from Curara, and although commercial, is somewhat difficult to obtain.

Arrow Poisons: Their history, sources, and constituents.—(*Stockman*) *P.J.* '98, ii. 548, 585.

Medicinal Properties.—It has been used in the treatment of Strychnine poisoning, hydrophobia, chorea, and tetanus.

In the convulsions of chorea, and to prevent painful spasms in moving wounded persons (*B.M.J.* '04, ii. 1642). Has an influence in diminishing the severity of the tonic and clonic tetanic spasms (*L.* '05, i. 991), and should be injected hypodermically morning and evening, commencing with $\frac{1}{6}$ grain and gradually increasing the dose according to the severity of the spasms to 1 grain; also 20 to 30 c.c. of antitetanic serum injected under the skin of the abdomen and repeated daily for a week or ten days.

Dose.—$\frac{1}{12}$ to $\frac{1}{2}$ grain = 0·005 to 0·032 gramme, but should be used with great care.

Foreign Pharmacopœias.—Official in Mex. (Curaro). Not in the others.

Descriptive Notes.—Curare is usually imported from Venezuela in the form of a blackish extract contained in small gourds about 2½ inches in diameter. A fragment of the extract placed in a drop of Alcohol on a microscopic slide shows a brownish fluid copiously studded with quadrilateral prisms (supposed to be Curarine, which forms four-sided prisms) and an abundance of minute particles of a yellowish tint which consist of Calcium Oxalate. The principal ingredient in Curare is the bark of *Strychnos toxifera*, but that of other species is also used in different districts, thus in British Guiana the bark of *S. toxifera*, Schomb., *S. Schomburgkii*, Kl., and *S. cogens*, Benth., are used in the Curare of the Macusi, Orecuna and Wapisiana tribes, that of *S. Gubleri*, Planch., by the Moquitari and Puaroa Indians, between the Orinoco and Rio Negro, and that of *S. Castelnoeana*, Wedd., by the Ticuna, Peba Yagua and Oregona Indians in the districts of the Upper Amazon; that of *S. Crevaunii*, Planch., by the Trio and Roucouyenne Indians of French Guiana. It is obvious, therefore, that Curare is an extract of uncertain composition as regards the species of *Strychnos* employed, and the more so that different ingredients are added to the extract by different tribes. A preparation made in this country from the bark of *S. toxifera* imported from British Guiana would, therefore, be far more reliable. Curare is said to have been used successfully in hydrophobia.

INJECTIO CURARÆ HYPODERMICA.—Curare, 1; make it into a paste with Distilled Water recently boiled and cooled; transfer to a funnel plugged with absorbent Wool, and gradually pour upon it Distilled Water until 10 is obtained.—*B.P.C.*

B.P.C. Formulary 1894 gave the strength as 1 grain in 12 minims.

Dose.—1 to 6 minims = 0·06 to 0·36 c.c.

CUSPARIÆ CORTEX.

CUSPARIA BARK.

Fr., Angusture Vraie; Ger., Angosturarinde; Ital., Corteccia de Angustura; Span., Corteza de Angostura.

The dried Bark of *Cusparia febrifuga*, DC.

The alkaloids, **Cusparine, Cusparadine, Galipeine,** and **Galipidine** have been extracted from Cusparia Bark. The bitter principle **Angosturin,** to which the bitterness of the bark has been assumed to be due has also been isolated, and a small quantity of a volatile Oil. **Cusparine Sulphate** and **Hydrochloride** are slightly soluble in Water, the Acetate and Tartrate much more so.—*P.J.* (3) xiv. 423.

Contains about 1·5 p.c. of ethereal oil.—*J.C.S. Abs.* '98, i. 37.

Medicinal Properties.—An aromatic bitter tonic. In South America it is given as an antiperiodic for malarial fever.

Prescribing Notes.—*Given in the form of the Infusion or the Concentrated Liquor, generally combined with Aromatics to prevent nausea.*

Official Preparations.—Infusum Cuspariæ and Liquor Cuspariæ Concentratus.

Foreign Pharmacopœias.—Official in Mex. (Angostura Verdadera) and Port. Not in the others.

Descriptive Notes.—The bark of *Cusparia febrifuga* varies somewhat in appearance and size, the outer surface being in some pieces smooth and hard, and in others soft and spongy. The pieces are usually curved, 2 to 4 or more inches long (4 to 5, *B.P.*); about $\frac{1}{12}$ inch in thickness and 1 inch or more in diameter. Its distinctive characters are the short, resinous, brown fracture, laminated inner surface, characteristic odour and flavour, in addition to its bitterness.

The character mentioned in the *B.P.* of numerous white points on the transverse fracture is also found in Nux Vomica bark, which was at one time substituted for it in commerce. The latter, however, has a paler fracture with a definite paler line separating the corky portion, is not laminated, and is purely bitter without any special flavour. In powder Cusparia Bark may be recognised by the presence of numerous oil cells, by the acicular as well as single, oblique prismatic crystals of Calcium Oxalate, and by having very thick-walled bast fibres, which are coloured canary-yellow by Caustic Potash.

Tests.—Cusparia Bark yields about 8 p.c. of ash, and 10 p.c. is rarely exceeded.

Preparations.

INFUSUM CUSPARIÆ. Infusion of Cusparia.

Cusparia Bark, in No. 20 powder, 1; Distilled Water, boiling, 20; infuse for fifteen minutes; strain. (1 in 20)

Dose.—1 to 2 fl. oz. = 28·4 to 56·8 c.c.

Incompatibles.—Mineral Acids, Ferric Chloride, and other metallic salts.

LIQUOR CUSPARIÆ CONCENTRATUS. Concentrated Solution of Cusparia.

10 of Cusparia Bark, in No. 40 powder, percolated with Alcohol (20 p.c.), to yield 20. (1 in 2)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Tests.—Liquor Cuspariæ Concentratus has a specific gravity of 1·010 to 1·020; contains about 10·0 p.c. w/v of total solids and about 20·0 p.c. w/v of Absolute Alcohol.

Infusum Cuspariæ Concentratum.—Cusparia Bark, in No. 40 powder, 40; Alcohol (90 p.c.), 25; Dilute Chloroform Water (1 in 1000), *q.s.* to make 100. Prepare by macero-expression.—*Farr* and *Wright*, *P.J.* '06, i. 165 and '07, i. 621; *C.D.* '06, i. 252; *Y.B.P.*, 1907, 249.
This appears in the *B.P.C.*

CUSSO.

KOUSSO.

FR., COUSSO; GER., KOSOBLÜTHEN; ITAL., KOUSSO; SPAN., FLOR DE COUSO.

The dried panicles of pistillate Flowers of *Brayera anthelmintica*, Kunth. (of *Hagenia abyssinica* (Bruce) Gmelin, *U.S.P.*).

Obtained from Abyssinia.

Medicinal Properties.—Anthelmintic. Especially useful for the different kinds of tapeworm. Should be followed by a purgative to expel the dead worm.

Dose.—¼ to ½ oz. = 7·1 to 14·2 grammes.

Prescribing Notes.—*The Flowers, in coarse powder, are mixed with half a pint of warm Water, allowed to stand for fifteen minutes, stirred up (not strained), and taken in 2 or 3 draughts at short intervals. It should be taken in the morning on an empty stomach, the bowels having previously acted. After three or four hours a brisk purgative should be administered. On account of its liability to produce nausea a little Lemonade may be taken afterwards.*

Foreign Pharmacopœias.—Official in Austr. (Koso); Belg., Fr. and Port. (Cousso); Ital. (Kousso); Ger., Jap. and Swiss (Flores Koso); Hung. (Kusso); Mex. (Cuso); Norw. and Swed.; Russ. (Flores Kusso); Span. (Couso); U.S. (Cusso).

The Infusion is official in Belg. 2 in 15; Fr. (Apozème de Cousso) about 1 in 8; Span. (Inf. de Couso), 1 in about 16½, *B.P.C.* 6 in 100.

Descriptive Notes.—Cusso is generally imported in rolls about 1½ to 2 feet long (3 to 6 dcm.) and 2½ to 3 inches in diameter, each consisting of the large panicled inflorescence of female flowers. The flowers are shortly stalked, pubescent, and consist of the two rounded bracts, a calyx of 5 outer, rigid, purple-veined sepals, and 5 inner, smaller, incurved, shrivelled segments. The 5 caducous white petals as well as the abortive stamens are usually absent in the drug, there are two carpels, and the style with two broad hairy stigmas is exserted. The large stems should be rejected (*U.S.P.*), and also samples which have lost their reddish tint and become brownish, indicating age and deterioration. The male flowers, which are excluded by the *B.P.*, *U.S.P.* and *P.G.*, have a greenish tint, and the outer sepals are not enlarged. The powder is characterised by the thick-walled unicellular hairs, the numerous rosette crystals, as well as simple and segmented capitulate short-stalked glands (*Koch*). It should not contain pollen grains, nor fragments of vessels more than 0·002 mm. in diameter (*P.G.*), but Koch states that pollen grains do not occur in it.

Not Official.

CYDONIUM.

QUINCE SEED.

The Seeds of *Pyrus Cydonia*.

Their coriaceous envelope abounds in Mucilage.

Medicinal Properties.—Demulcent. The **decoction** is used externally for cracks in the skin. A nice adjunct to eye-lotions in cases of irritation and inflammation.

Foreign Pharmacopœias.—Official in Belg., Port. (Marmelo), Mex. (Membrillo), and Swiss. Not in the others. The fruit is official in Fr. (Coing).

DECOCTUM CYDONII.—Quince Seed, 1; Distilled Water, 80. Boil for ten minutes, and strain.

This has been incorporated in the *B.P.C.*

MUCILAGO CYDONII.—1 of Quince Seed and 25 of Water; by cold maceration. Was official in Austrian Ph. (1889), and is the strength now incorporated in the *B.P.C.*

Fr., 1 in 10; Port., 1 in 100.

Not Official.

CYLLIN.

Jeyes' Cyllin (medical) is a non-toxic antiseptic; it contains 50 p.c. of a new series of oxidised Hydrocarbons, free from Phenol and its homologues, emulsified with neutral Tar Oil. Its Carbolic Acid coefficient for *Bacillus Typhosus* is 20.—*L.* '07, i. 33.

Preparations for internal administration are Cyllin Capsules, Cyllin Pastilles and Cyllin Syrup.

The dressings, Cyllin Lint, Gauze and Wool, each contain 10 p.c. of Cyllin.

Two Gelatin plates were inoculated with Staphylococcus pyogenes aureus, one was medicated with Cyllin inhalant, and the other was unmedicated. The former showed no sign of growth, the latter a copious and normal growth.—*L.* '05, i. 988. A new use of the inhalant is thus indicated in combating the symbiotic action of the pus microbe in pulmonary tuberculosis.

3-minim doses given (*L.* '05, ii. 1148), in the form of a keratin-coated capsule, every second hour if necessary in the treatment of sprue, but rarely more than 8 a day are required. Best time to administer it is after food.

Attention has been called (*B.M.J.* '04, ii. 1119) to its value as a tubercle bactericide, it being claimed to be non-toxic and about twenty times as powerful as Carbolic Acid, and hence its trial in cases of tuberculosis.—*L.* '05, i. 377.

Not Official.

CYNOGLOSSUM.

The Root of *Cynoglossum officinale*, L. It contains an amorphous alkaloid **Cynoglossine.**

Medicinal Properties.—Has been used as a demulcent and sedative.

Foreign Pharmacopœias.—Official in Dan., Fr., Mex., Norw., Port. and Span. Not in the others.

Pulvis Cynoglossi Compositus is official in Dan., Fr. and Norw.; Pilulas Cynoglossi in Dan.; Pildoras de Cinoglosa in Mex., and Span.

Fr., Pilules de Cynoglosse Opiacées, each pill contains 0·02 gramme (⅓ grain) of Extract of Opium, and 0·02 gramme of Powdered Henbane Seeds.

Not Official.

CYPRIPEDIUM.

The Rhizome and Roots of *Cypripedium hirsutum*, Mill., and of *Cypripedium parviflorum*, Salisb., are official in U.S. Commonly known as Lady's Slipper.

Cypripedin is the dried extractive of the above, and has been recommended in hypochondriasis, chorea and epilepsy.

The eclectic remedy 'Cypripedin,' which is stated to be prepared by precipitating a concentrated tincture of the root with Water, is complex in composition and stated to have no claim to the name given it.

It may be used in doses of 1 to 5 grains = 0·065 to 0·32 gramme.

A 1 in 1 **Fluid Extract** (Alcohol 48·9 p.c.) is official in the U.S., average dose 15 minims = 0·9 c.c.

Not Official.

DAMIANA.

The Leaves of one or more species of *Turnera*, from Mexico and California.

Contains a bitter substance, resins, and a volatile oil.

Medicinal Properties.—Tonic, diuretic, and aphrodisiac.

Prescribing Notes.—*Frequently given in the form of* **pill**; *the Hard Extract makes a good pill with a small quantity of Alcohol* (90 *p.c.*); *the Soft Extract is best hardened with the powdered Leaves. The Liquid Extract is given in* **capsules.**

Foreign Pharmacopœias.—Official in Mex.

Descriptive Notes.—Damiana occurs in commerce in two or three different varieties. The kind which is considered the best is known as Helmiclis Damiana, and is derived from *Turnera aphrodisiaca*, L. Ward (nat. ord. *Turneraceæ*) and is a native of California and Mexico. The leaves, of a light green colour, are wedge-shaped, usually less than an inch in length (10 to 25 mm.) and about $\frac{1}{4}$ inch (5 to 10 mm.) in diameter in the broadest part, with about 3 to 6 coarsely crenate teeth on either side besides the terminal one. The taste recalls that of figs, but is aromatic and slightly bitter. The plant is considered by some botanists to be a variety of *T. diffusa*, Willd. It has reddish stems and thinner, smoother and less hairy, greener leaves, not greyish-green as in the type. The leaves of another species, possibly *T. microphylla*, Desv., are sometimes substituted for it. They are smaller, more hairy, with hairy stems which are not reddish. The leaves of *Aplopappus discoideus*, DC., nat. ord. *Compositæ*, are occasionally offered as Damiana. They have fewer, more distant, seriate teeth, usually three on either side, and composite flowers with hairy pappus, usually mixed with the leaves.

EXTRACTUM DAMIANÆ LIQUIDUM.—Damiana leaves exhausted with Alcohol (60 p.c.); 1 of fluid represents 1 of the drug.

This has been incorporated in the *B.P.C.*

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

EXTRACTUM DAMIANÆ.—The above evaporated to a soft extract.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

This has been incorporated in the *B.P.C.*

MISTURA DAMIANÆ COMPOSITA.—Sodium Hypophosphite, 5 grains; Calcium Hypophosphite, 5 grains; Liquid Extract of Damiana, $\frac{1}{2}$ fl. drm.; Liquid Extract of Nux Vomica, 2 minims; Chloroform Water, to 2 drm.—*Martindale.*

This has been incorporated in the *B.P.C.*

PILULA DAMIANÆ COMPOSITA.—Extract of Damiana, 2 grains; Phosphorus, $\frac{1}{100}$ grain; Extract of Nux Vomica, $\frac{1}{8}$ grain.—*Martindale.*

Extract of Damiana, 2 grains; Extract of Nux Vomica, $\frac{1}{10}$ grain; Phosphorated Suet (10 p.c.), $\frac{1}{10}$ grain; mix quickly these three with about $\frac{1}{4}$ minim of Chloroform and add $\frac{1}{10}$ grain of Compound Tragacanth Powder and Mucilage of Acacia *q.s.*—*B.P.C.*

DIGITALIS FOLIA.

DIGITALIS LEAVES.

FR., DIGITALE; GER., FINGERHUTBLATTER; ITAL., DIGITALE; SPAN., HOJA DE DIGITAL.

The dried leaves of *Digitalis purpurea*, L. Collected from plants commencing to flower. The *U.S.P.* specifies that the leaves should be collected from plants of the second year's growth.

Medicinal Properties.—Cardiac and circulatory stimulant and tonic, increases the strength and efficiency of the cardiac contractions, and reduces the pulse rate without diminishing tension. Specially useful in mitral and tricuspid lesions with loss of compensation; in cardiac insufficiency from whatever cause, with irregular and rapid action and low arterial tension; not indicated in purely aortic cases. Of great value as a cardiac stimulant in acute pneumonia; useful in pulmonary hæmorrhage due to mitral disease. Diuretic, useful in cardiac dropsy; also in renal dropsy when acute or when due to failure of a hypertrophied heart.

It is cumulative in action, and requires watchfulness. Its continued use deranges the alimentary system; therefore, after it has been taken for eight or ten days it should be left off for three or four days and then recommenced. According to Lauder Brunton, Digitalis is distinctly dangerous in advanced fatty degeneration of the heart; he also thinks it harmful in advanced Bright's disease. For a comparison with Strophanthus *see* under *Strophanthi Semina.*

According to Kiliani, the **seeds** of *Digitalis purpurea* contain Digitalinum verum, and Digitonin; the **leaves** contain Digitoxin, but neither of the other two. Preparation of Digitalin also described.—*J.C.S. Abs.* '96, i. 58, 59, 180; '97, i. 95; *P.J.* '95, ii. 29, 120; '96, ii. 289.

Treatment of pneumonia by Digitalis.—*B.M.J.E.* '95, ii. 32; '96, ii. 76; '97, i. 15.

Digitoxin in doses of $\frac{1}{4}$ milligramme = $\frac{1}{260}$ grain.—*B.M.J.E.* '97, i. 31.

Best administered as tincture or dried leaf in pill form, one advantage being combination of active principles whereby overaction is obviated.—*L.* '02, i. 673.

Untoward effects of 20 to 24 minims of the tincture taken daily for five days in a weakly overgrown boy of 10 years.—*B.M.J.E.* '02, i. 1068.

The administration of Digitalis particularly deprecated in unduly high blood pressure.—*B.M.J.* '99, i. 85.

In the treatment of the rapid heart of influenza, where there is cardiac dilatation that lasts some weeks. Intermittent administration best. 10 to 20 minims of Tincture, $\frac{1}{2}$ drm. of the Infusion or 1 grain Powdered Leaves, thrice daily for three days with intervals of three or more days during which the drug is withheld, or 2 to 4 granules of Nativelle's Digitalin containing $\frac{1}{10}$ milligramme once in twenty-four hours for two days with intervals of at least three days.—*L.* '99, ii. 1079.

Some remarks upon Digitalis treatment in chronic disorders of the circulation, and especially upon the continuous use of Digitalis.—*Pr.* lxiv. 385.

An experimental investigation into the treatment of Digitalis poisoning. Nitroglycerin, besides possessing a greater antagonistic action to Digitalis than any other known drug, is also relatively non-toxic, and for the reduction of internal tension Nitroglycerin or an ally is the best remedy, but with a low blood pressure these substances are useless.—*B.M.J.* '99, ii. 1265.

Influence on the heart muscle when administered for a long time.—*T.G.* '97, 800.

Although this is the most powerful remedy in mitral disease which we possess, in cases of pure aortic regurgitation (*B.M.J.* '06, i. 1462), it is not only a dangerous drug but is actually a poison. It acts as a diuretic in cardiac dropsy (*B.M.J.* '06, i. 10). The diuresis produced by the ordinary doses of the pharmacopœial preparations of the drug does not make its appearance before the third or fourth day of administration. To be useful in cardiac dropsy it must be given in full doses.

The pharmacological action of Digitalis, Strophanthus, and Squill is fully considered.—*B.M.J. Supplement*, '06, ii. 13; *P.J.* '06, ii. 28.

Dose.—In powder, $\frac{1}{2}$ to 2 grains = 0·032 to 0·13 gramme.

Ph. Ger. maximum single dose, 0·2 gramme; maximum daily dose, 1·0 gramme.

Prescribing Notes.—*The fresh Infusion is preferred by some to the Tincture. The powdered leaf is ordered in Pills with other ingredients. Ferrous Sulphate is not uncommonly prescribed with the fluid preparation of Digitalis, with a resulting blackening from the tannin of Digitalis ; where this is an objection it can be prevented by the addition of Citric Acid : 6 grains of Citric Acid are sufficient for* 12 *grains of Ferrous Sulphate ; or the powdered drugs can be given in pills.*

Incompatibles.—Ferrous Sulphate, Tincture of Ferric Chloride, preparations of Cinchona, and Lead Acetate.

Official Preparations.—Infusum Digitalis and Tinctura Digitalis.

Not Official.—Fluidextractum Digitalis, Infusum Digitalis Concentratum, Pilula Digitalis Composita, Pilula Digitalis et Hydrargyri Composita, Pilula Digitalis et Opii Composita, Succus Digitalis, Syrupus Digitalis, Vinum Digitalis Compositum, and Digitalin (various).

Antidotes.—In case of an overdose, a recumbent posture is of paramount importance; and after the stomach has been emptied, 20 grains of Tannic Acid in hot Water given frequently, or hot strong Tea or Coffee; stimulants and warmth should be employed.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port. (Dedaleira), Russ., Span. (Digital), Swed., Swiss and U.S.

The *Brussels Conference* agreed to use the leaf of the second year, and the powdered drug to be used entire.

Tests.—The ash of Digitalis varies from 7 to 10 p.c., and should not exceed the latter figure. In the present state of our knowledge of the subject a chemical method of determination is of doubtful utility, and it is generally conceded that a physiological method of standardisation leaves much to be desired.

The more or less definite principles contained in Digitalis may be arranged as follows under the names applied to them by Schmiedeberg.

(*a*) **Digitonin.**—A crystallisable body resembling Saponin, constituting the larger part of the glucosidal constituents. It softens at 225° C. (437·0° F.), and melts completely at 235° C. (455·0° F.). The aqueous solution is lævorotatory, and is precipitated by Tannin, Ammoniacal Lead Acetate, and Barium Hydroxide Solution. Soluble in Water, insoluble in cold Alcohol, Ether, Benzol, or Chloroform. It has none of the physiological action peculiar to Digitalis, and in other respects is directly injurious.

(*b*) **Digitalein.**—An amorphous glucoside (possibly a mixture). Soluble in Water and in Alcohol, insoluble in Ether or Chloroform. Its action on the heart is non-cumulative, and it causes no irritation when subcutaneously injected.

(*c*) **Digitalin.**—A white amorphous powder or soft white grains which remains unchanged when heated to 200° C. (392·0° F.), begins to aggregate at 210° C. (410·0° F.), and melts about 217° C. (422·6° F.). It is soluble in Alcohol, almost insoluble in Water, sparingly soluble in Ether or Chloroform. It dissolves in concentrated Hydrochloric or Sulphuric Acid with golden yellow colour, the colour in the latter instance changing rapidly to a blood red. On adding to the solution whilst still yellow a drop of either Nitric Acid, Ferric Chloride, or Bromine Water, a brilliant purple coloration is produced.

Possesses in a high degree the medicinal action of Digitalis.

(*d*) **Digitoxin.**—Pearly plates or needles melting at 240° C. (464° F.). *Fr. Codex* (1908) gives 243° C. (469·4° F.). Easily soluble in Alcohol, slowly in Chloroform, very sparingly in Ether, quite insoluble in Water. It does not give the colour reaction of Digitalin with strong Sulphuric Acid. It yields a yellow or greenish coloration when warmed with strong Hydrochloric Acid. The *French Codex* gives the following test: If weighed quantities of about 0·005 gramme of Ferric Sulphate be dissolved separately in 2 c.c. of Glacial Acetic Acid and in 2 c.c. of concentrated Sulphuric Acid, then if the Acetic Acid Solution of the Iron salt, previously mixed with a trace of Digitoxin, be poured gently on to the surface of the Sulphuric Acid containing the Iron salt in such a manner that the two liquids do not mix, at the point of contact of the two liquids there is developed a brown-coloured zone, the colour changing to green and then to indigo-blue and after half an hour the Acetic Acid is coloured entirely blue. This characteristic reaction for Digitoxin was given in the 17th edition of the *Companion* as follows: When dissolved in Acetic Acid to which has been added 1 p.c. of a solution containing 5 p.c. of Ferric Sulphate, and Sulphuric Acid containing the same quantity of Ferric Sulphate is poured into the tube so as to form a layer beneath it, a blue colour is gradually developed in the Acetic Acid, whilst the Sulphuric Acid remains colourless; this coloration in the Acetic Acid is not produced by any other of these compounds.

The most toxic of all the constituents, but uncertain, cumulative, and dangerous in its action.

(*e*) **Digitin.**—A crystalline body, physiologically inert, difficultly soluble in Water, more readily in Alcohol, insoluble in Ether or Chloroform.

It dissolves in concentrated Sulphuric Acid with brownish-yellow colour, which becomes purple-red on exposure to air, the addition of Water turning the colour to green. It is insoluble in Hydrochloric Acid, but dissolves in Nitric Acid without coloration. It does not reduce Fehling's Solution until after boiling with dilute acid.

Descriptive Notes.—The Digitalis leaves of commerce are probably collected, not only from plants in flower, but from plants of the first year's growth and from shoots formed laterally from the second year's plant after flowering. The leaves accordingly differ in size and shape. The root leaves are broadly ovate, lanceolate, and crenate-serrate, and much larger and wider at the base than the stem leaves, which have shorter stalks and are gradually less ovate and more lanceolate and smaller from the base to the top of the leafy stem. The dimensions given in the *B.P.*, viz., 10 to 30 cm. (4 to 12 inches) long, and 12½ to 15 cm. (5 or 6 inches) broad, cover all the above forms of leaf. The leaves have a bitter taste, but no distinct odour. The features that distinguish Foxglove leaves from other similar leaves are the lower veins, which are placed at a very acute angle to the base of the mid-rib and are decurrent into the petiole, the faintly areolate (rugose, *B.P.*) upper surface, and the paler under surface, densely pubescent with short hairs, and reticulated with prominent small veins. Other leaves occasionally found mixed with those of Foxglove differ in the venation and in the character of the hairs, which in Digitalis are of two kinds, viz., 1 to 5 celled simple hairs (usually 3 celled, *B.P.*), with occasionally a glandular head, and short 1 to 2 celled hairs with a single or a twin gland at the apex.

The powdered leaves are distinguished by the absence of raphides and stone cells, by sinuous epidermal cells with small stomata, the 1–5-celled hairs with a more or less warty surface, and short glandular hairs.

Digitalis leaves soon lose their activity unless kept quite dry; they can be obtained in commerce with the mid-rib removed and packed dry in hermetically sealed bottles. The tincture would probably be more effective if prepared from the fresh leaves with rectified spirit and then heated to boiling point to prevent changes arising from the action of natural ferments in the leaves, since this takes place in the leaves in the presence of the 12 p.c. of moisture which they absorb after drying, if not enclosed in airtight vessels as soon as dried. The *P.G.* points out the triangular character of the petiole, and that the upper stem leaves may be sessile. The leaves should be obtained from wild plants. The *U.S.P.* directs leaves collected from the second year growth at the commencement of flowering, and that stone cells, star-shaped hairs, and Calcium Oxalate crystals should not be present. Continental Digitalis leaves are liable to be adulterated with many other leaves—*see Apotheker Zeitung*, xxi. pp. 242, 252, 267, 276, where the distinctive features of the probable adulterants are given.

Preparations.

INFUSUM DIGITALIS. Infusion of Digitalis

Digitalis Leaves, in No. 20 powder, 60 grains; boiling Distilled Water, 20 fl. oz. Infuse fifteen minutes; strain.

Dose.—2 to 4 fl. drm. = 7·1 to 14·2 c.c.

1 fl. oz. represents 3 grains of Leaves.

Foreign Pharmacopœias.—Official in Mex., Port. and Span., 1 in 200; Ital. and Swed., 1 in 100; U.S., with Cinnamon, 3 in 200. Not in the others.

Infusum Digitalis Concentratum.—Digitalis Leaves, in No. 20 powder, 5·5; Alcohol (90 p.c.), 20; Dilute Chloroform Water (1 in 1000), *q.s.* to make 100. Prepare by macero-expression. Dose, 15 to 30 minims.—*Farr* and *Wright*, *P.J.* '06, i. 165, and '07, i. 622; *C.D.* '06, i. 252; *Y.B.P.*, 1907, 249.

This appears in the *B.P.C.*

TINCTURA DIGITALIS. Tincture of Digitalis.

2½ of Digitalis Leaves, percolated with Alcohol (60 p.c.) to yield 20. (1 in 8)

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Ph. Ger. maximum single dose, 1·5 grammes; maximum daily dose, 5·0 grammes, of the 1 and 10 Tincture.

Larger doses are occasionally given, but, according to some observers, the results with small doses are equally good and not nearly so dangerous.

In cases of delirium tremens, 1 fl. drm. every three hours. Two or even three fl. drm. in cases carefully watched.—*Pr.* xxvii. 373.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Russ., Swiss and U.S., 1 in 10; Ger., Ital., Jap., Norw., Span. and Swed., 1 and 10; Hung. and Port., 1 in 5. Also Port. and Span., 1 **fresh Leaves,** 1 Spirit; Span., with Ether, 1 dried Leaves in 5; Dan. and Port., with Spirit of Ether, 1 dried Leaves in 10; Mex., **Seeds** 1 in 5; also Ethereal Tincture 1 and 5. All by weight except U.S.

The *Brussels Conference* agreed to a strength of 10 p.c. prepared by percolation with Alcohol (70 p.c.). Belg., Dan., Fr. and Swiss adopt this.

Tests.—Tincture of Digitalis possesses a specific gravity of 0·930 to 0·935; contains from 3 to 4 p.c. w/v of total solids and about 55·0 p.c. w/v of Absolute Alcohol.

A suggestion for the preparation of a fat-free Tincture (*A.J.P.* '99, 332), by exhausting the leaves with purified Petroleum Benzin previous to the preparation of a Tincture by the official process. The resulting tincture is claimed to be less nauseating than the ordinary tincture, and to be more rapidly absorbed. Abscesses never followed its hypodermic use, whilst the official Tincture almost invariably causes pain, swelling, and abscess formation.

A fermentation test has been suggested (*C.D.* '02, i. 456) to prove the activity of Digitalis leaves. A weighed quantity of 20 grains of Amygdalin is dissolved in 1 fl. oz. of Water at 30° C. (98° F.) in a wide-mouthed bottle and set aside as a control specimen. A similar quantity of Amygdalin, together with 60 grains of powdered Digitalis leaves, is mixed in another bottle. At the end of eight hours the plain Amygdalin solution should show no change, but the specimen to which the Digitalis has been added should have developed a bitter Almond odour, and should yield a reaction for Hydrocyanic Acid when a rod moistened with Silver Nitrate solution is laid over the mouth of the bottle. The test is considered (*C.D.* '02, i. 509) ingenious, but inconclusive, as it does not prove the presence or absence of Digitoxin.

Not Official.

FLUIDEXTRACTUM DIGITALIS (*U.S.*).—A 1 in 1 fluid extract prepared by exhausting the Leaves with Alcohol (49 p.c.).

Dose.—1 to 2 minims = 0·06 to 0·12 c.c.

Foreign Pharmacopœias.—Official in Dan., Mex. and U.S. Not in the others.

Extractum Digitalis (*U.S.*) is the Fluid Extract evaporated (not exceeding 50° C.) to a pill consistence.

PILULA DIGITALIS COMPOSITA.—Digitalis Leaves, in powder, 1 grain; Squill, in powder, 1 grain; Mercury Pill, 1 grain.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*, with the *syn.* Guy's Pills, and a note that Baillie's or Gilmour's Pills contain twice as much Squill.

PILULA DIGITALIS COMPOSITA (Baillie's Pill).—Digitalis Powder, ½ grain; Squill, 1 grain; Mercury Pill, 2 grains; in one pill.—*St. George's.*

PILULA DIGITALIS ET HYDRARGYRI COMPOSITA.—Mercurial Pill, 1 grain; Powdered Digitalis, 1 grain; Powdered Squill, 1 grain; Extract of Henbane, 2 grains.—*St. Bartholomew's.*

PILULA DIGITALIS ET OPII COMPOSITA (Heim's Pill).—Quinine Sulphate, 1 grain; Digitalis, in powder, ⅓ grain; Opium, in powder, ¼ grain; Ipecacuanha, in powder, ⅓ grain; Glycerin of Tragacanth, *q.s.*—*Pharm. Form.*

Digitalis Leaves, in powder, ⅓ grain; Opium, in powder, ¼ grain; Ipecacuanha Root, in powder, ⅓ grain; Quinine Sulphate, 1 grain; Syrup of Glucose, *q.s.*—*B.P.C.*

SUCCUS DIGITALIS.—The Expressed Juice, 3; Alcohol (90 p.c.), 1.

This preparation may be given for a longer period than the Tincture without causing nausea.

Dose.—5 to 10 minims = 0·3 to 0·6 c.c.

This has been incorporated in the *B.P.C.*

SYRUPUS DIGITALIS.—Tincture of Digitalis, 1; Simple Syrup, 19.—*Belg.* and *Fr.*

VINUM DIGITALIS COMPOSITUM.—Digitalis Leaves, in No. 40, powder, 5; Squill, 7·5; Juniper Fruit, 75; Alcohol, 100; White Wine, 900; Potassium Acetate, 50.—*Belg.* and *Fr.*

Alcoholic Extract 2, Water 360, Sugar 640.—*Span.*

DIGITALIN.—Under this name four distinct varieties occur in commerce, which differ so considerably in their medicinal properties that prescribers should be careful to distinguish and specify the kind intended All four of them are soluble in Alcohol.

1. **Digitalin Amorphous (Homolle).**—A white or yellowish-white amorphous bitter powder. Soluble in Chloroform, slightly soluble in Water. Stated to consist mainly of Digitalin with some Digitoxin. Now omitted from *Fr. Codex.*

Foreign Pharmacopœias.—Official in Port. and Span.; formerly in Brit.

2. **Digitalin Crystallised (Nativelle).**—Fine white needles, insoluble in Water, Ether or Benzene; soluble in Alcohol (90 p.c.) and in Chloroform. It is stated to consist almost entirely of Digitoxin, and is cumulative in its action. *See* Digitoxin.

Foreign Pharmacopœias.—Official in Fr., Mex. and Span.

Granules de Digitaline Cristallisée (*Fr. Codex*) contains $\frac{1}{10}$ milligramme in each granule. Soluté de Digitaline Cristallisée au Millième contains one milligramme to each gramme.

Digitoxin, official in *Swiss*, is a white, crystalline, odourless powder with a bitter taste, insoluble in Water, soluble in Alcohol (90 p.c.), and in Chloroform.

3. **Digitalin German.**—Amorphous; consists principally of Digitalein with some Digitonin and Digitalin. Readily soluble in Water, almost insoluble in Chloroform.

4. **Digitalin Verum.**—Kiliani (*P.J.* (3) xxii. 1061) states, with some show of reason, that the Digitalin of Schmiedeberg is the best form in which to prescribe Digitalis, and to distinguish it he applies the name Digitalin Verum. Its composition is definite; it is obtainable commercially in a sufficiently pure condition; it possesses all the medicinal activity in regard to the action of Digitalis upon the heart; it is non-cumulative in its action; the dose is $\frac{1}{4}$ milligramme ($\frac{1}{270}$ grain) every 2 or 3 hours; it is soluble about 1 in 1000 of Water, about 1 in 100 of Alcohol (50 p.c.). The aqueous solution froths upon being shaken, and is remarkably prone to become mouldy.

Not Official.

DUBOISIA MYOPOROIDES.

A plant indigenous to N.S. Wales and Queensland; it has been classed in the order *Solanaceæ.*

Ringer's experiments show that the physiological action of the extract is apparently identical with that of Atropine. Tweedy has used it as an application to the eye in all cases in which Atropine is indicated.

Foreign Pharmacopœias.—Official in Span.

The name **Duboisine** represents a variable product obtained from this plant. Pseudo-hyoscyamine from *Duboisia myoporoides*, R.Br., isomeric with Atropine and Hyoscyamine, has been described by Merck.

Foreign Pharmacopœias.—Official in Mex.

Duboisine Sulphate is an amorphous hygroscopic powder, soluble in Water, consisting of an indefinite mixture of Hyoscyamine and Hyoscine Sulphates, and the Sulphates of other bases.

Not Official.

DUGONG OIL.

An Oil obtained in Australia from *Halicore Dugong*, Daub., by boiling the superficial fat. A substitute for Cod-Liver Oil, recommended at one time (*P.J.* (3) iii. 3, 100) as not being disagreeable in taste, but it does not possess this character now.

Not Official.

DULCAMARA.

The dried young Branches of *Solanum Dulcamara* (Bittersweet), from indigenous plants which have shed their leaves.

Fresh specimens have been found (*C.D.* '02, ii. 313; *Y.B.P.* '02, 491) to contain two alkaloids (Solanine and Solanidine), a glucoside (Solanein), and a bitter principle (Dulcamarin) of a glucosidal nature yielding on hydrolysis Dulcamaretin and Glucose.

Medicinal Properties.—Alterative and sedative. Used in cutaneous eruptions, chiefly of a scaly nature, as psoriasis and pityriasis, a decoction being applied externally, at the same time that it is used internally.

An alkaloid **Solanine** obtained from *Solanum nigrum*, *S. Dulcamara* and *S. tuberosum* (Potato plant), has been recommended as an analgesic.—*L.M.R.* '86, 496; '88, 242; *T.G.* '87, 56; '88, 630; *L.* '87, ii. 1097.

Foreign Pharmacopœias.—Official in Austr., Fr. (Douce-amère), Mex., Port. (Doce-amarga), and Span. Not in the others.

EXTRACTUM DULCAMARÆ FLUIDUM.—1 fl. oz. equals 1 oz. Dulcamara. Prepared with diluted Alcohol.—*U.S.P.* 1890.

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Mex.

A solid Extractum Dulcamara is official in Austr., Fr. and Mex.

INFUSUM DULCAMARÆ.—Dulcamara, 1; boiling Water, 10; infuse 1 hour.

Dose.—1 to 2 fl. oz. = 28·4 to 56·8 c.c.

This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in Fr. (1 in 50). Not in the others.

ELATERIUM.

ELATERIUM.

FR., ELATERION; GER., ELATERIUM; ITAL., ELATERIO; SPAN., ELATERIO.

A sediment from the juice of the Fruit of *Ecballium Elaterium*.

It contains from 20 to 40 p.c. of Elaterin, to which principle the activity of the drug is due. It contains in addition a second crystallisable bitter principle, Prophetin, and the amorphous substances Ecballin or Elateric Acid, Hydroelaterin and Elateride, of which but little is at present known.

'Extractum Elaterii' was the official synonym in *B.P.* '85 for Elaterium.

Medicinal Properties.—The most powerful hydragogue cathartic, only used in special cases. Employed in cardiac or renal dropsy and in cerebral congestion. Its administration in a debilitated state of the system or in gastro-intestinal inflammation requires very great caution on account of the depression which it produces.

Dose.—$\frac{1}{10}$ to $\frac{1}{2}$ grain = 0·006 to 0·032 gramme.

Prescribing Notes.—*On account of the similarity in name to the active principle, care must be exercised to avoid confusion. The Pulvis Elaterini Compositus is often preferred; it is frequently given in the form of Pill with Compound Extract of Colocynth and Henbane. To prevent it causing persistent diarrhœa, it may be given with Henbane, especially in renal diseases; in cardiac cases it should be guarded by a stimulant to prevent too much depression.*

Official Preparations.—Elaterinum; **Elaterin** is contained in Pulvis Elaterini Compositus.

Not Official.—Pilula Elaterii Composita.

Antidotes.—The same as for Croton Oil (*q.v.* p. 460).

Foreign Pharmacopœias.—Official in Mex., Elaterio; Port., Extracto de Pepinos de S. Gregorio. Not in the others.

Descriptive Notes.—Two forms of Elaterium are met with in commerce, viz., English and Maltese.

The English form is very brittle, and consequently is usually met with in thin flakes or fragments $\frac{3}{4}$ inch to $\frac{1}{2}$ inch in width; the colour when fresh is green, soon becoming greyish, and when kept long or not kept dry it turns yellowish-grey. It should contain no Starch (*B.P.*); it yields up to 33 p.c. of Elaterin. The Maltese occurs in square cakes or tablets about 1 in. in diameter and rather more than $\frac{1}{12}$ in. in thickness, of a greenish-grey colour; it sometimes contains Starch and Calcium Carbonate, and yields about 27 p.c. of Elaterin.

The English drug is official.

Tests.—Elaterium should yield no marked effervescence on the addition of Hydrochloric Acid, indicating the absence of more than traces of Carbonates. When boiled with Water, cooled, and tested with Iodine Solution no decided blue coloration should be produced, indicating the absence of more than a trace of Starch.· It is officially required to yield 50 p.c. of its weight to boiling Alcohol (90 p.c.), and when exhausted successively with Chloroform and Ether and the process repeated, it is required to yield 25 p.c. or not less than 20 p.c. of Elaterin. Good specimens of Elaterium yield from 30 to 40 p.c. of Elaterin.

Preparations.

ELATERINUM. ELATERIN ($C_{20}H_{28}O_5$), eq. 345·60, occurs in small hexagonal scales or tables.

It is the active principle of Elaterium.

Solubility.—Insoluble in Water; sparingly in Alcohol (90 p.c.); 1 in 12 of Chloroform.

A recent figure obtained for Alcohol (90 p.c.) was 1 in 1100.

Dose.—$\frac{1}{40}$ to $\frac{1}{10}$ grain = 0·0016 to 0·0065 gramme.

Foreign Pharmacopœias.—Official in U.S. Not in the others.

Tests.—Elaterin when heated to 190° C. (374° F.) turns yellow, and melts at 216° C. (420·8° F.). No melting point is, however, given in the *B.P.* It should be neutral in reaction towards Litmus. A crimson colour rapidly changing to scarlet is produced on the addition of Sulphuric Acid to a solution of Elaterin in melted Phenol.

Sulphuric Acid colours it yellow, the colour gradually changing to scarlet. A crystal evaporated to dryness with a little Hydrochloric Acid leaves a residue which when washed with hot Water and subsequently treated with Sulphuric Acid produces a brownish-red colour. Mineral matter and alkaloids are the more commonly occurring impurities. The former may be detected by the residue left on the ignition of the sample with free access of air, the latter by the production of a precipitate when Tannic Acid Solution, Mercuric Chloride Test Solution, or Platinic Chloride Solution is added to a solution of the principle in Alcohol (90 p.c.).

PULVIS ELATERINI COMPOSITUS. COMPOUND POWDER OF ELATERIN.

Elaterin, 1; Milk Sugar, 39.

Dose.—1 to 4 grains = 0·06 to 0·24 gramme.

Foreign Pharmacopœias.—Official in U.S. (Trituratio Elaterini), Elaterin, 1; Milk Sugar, 9. Not in the others.

Not Official.

PILULA ELATERII COMPOSITA.—Elaterium, ¼ grain; Compound Extract of Colocynth, 2 grains; Calomel, 1½ grains; Capsicum, ½ grain; Syrup of Glucose *q.s.*—*St. Bartholomew's.*

Dose.—1 or 2 pills.

Not Official.

ELEMI.

A concrete, resinous exudation, the botanical source of which is undetermined, but is sometimes referred to *Canarium commune*, L. It has lately been attributed to *Canarium Luzonicum*, Miq.

It is imported from Manila.

When of good quality it is pale yellow of the consistence of stiff Honey and has a Fennel-like odour.

Brazilian and Yucatan Elemis are official in some of the Foreign Pharmacopœias, but are derived from other species of the same natural order *Burseraceæ*. They are usually more discoloured and harder, but have a similar odour.

Solubility.—The greater part is soluble in Alcohol (90 p.c.); wholly soluble in Ether.

Medicinal Properties.—The ointment is stimulant to indolent ulcers.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Fr., Mex. (Goma de Limon), Port., Span. and Swiss. Not in the others.

UNGUENTUM ELEMI.—Elemi, 1; Spermaceti Ointment, 4; melt, strain, and stir till cold.—*B.P.* 1885. (1 in 5)

This has been incorporated in the *B.P.C.*, using Unguentum Simplex.

Foreign Pharmacopœias.—Official in Mex., Span. and Swiss, 1 of Elemi and 1 of Turpentine in 4 of Ointment; Dutch, 3 of Elemi, 2 of Turpentine, in 10 of Ointment; Port., 2 of Elemi and 1 of Turpentine in 10. Not in the others.

Not Official.

EMBELIA.

The Fruit (including the dried Fruit and the Seeds) of *Embelia Ribes*, Burm. f., and of *Embelia robusta*, Roxb., are official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

The powdered Seeds are used in India for tapeworm.—*L.* '87, ii. 199.

Dose.—60 to 240 grains = 4 to 16 grammes.

ACIDUM EMBELICUM.—Obtained from the Seeds. Insoluble in Water. It forms salts with Ammonium, Potassium, and Sodium.

AMMONII EMBELAS.—A tasteless crystalline salt, in red needles.

Dose.—3 to 6 grains = 0·2 to 0·4 gramme, in Honey or Simple Syrup.

Not Official.

EMBLICA.

The fruit of *Phyllanthus Emblica* L., (Emblic Myrobalan) has been used in Hindu medicine for a long time, as a diuretic and laxative. The fresh fruits preserved in Syrup are imported into this country.

Not Official.

EPHEDRINE HYDROCHLORIDE.

The Hydrochloride of an alkaloid obtained from *Ephedra vulgaris*, L., or *E. Helvetica*, C. A. Mey.

Has been recommended as a mydriatic in the form of a 5 p.c. solution.—*B.M.J.E.* '98, ii. 92.

The addition to it of 1 p.c. of Homatropine Hydrochloride enhances its action, and the mixture, which is supplied under the name '**Mydrine**' is a white powder readily soluble in Water; a 10 p.c. aqueous solution dilates the pupil moderately within a few minutes, without affecting the accommodation, and its effects pass away in two to four hours. It is useful in diagnostic examinations.—*L.* '98, ii. 24; *T.G.* '98, 757.

ERGOTA.

ERGOT.

Fr., Ergot de Seigle; Ger., Mutterkorn; Ital., Segala Cornuta; Span., Cornezuelo de Centeno.

The sclerotium of *Claviceps purpurea*, Tulasne, in the ovary of *Secale cereale*, L.*

The drug should be stored whole, should be well dried, and kept in airtight vessels and perfectly dry. The *U.S.P.* says that after being kept for one year it is unfit for use.

The two principal varieties of Ergot are Spanish and Russian. They contain respectively about 0·2 and 0·25 p.c. of Ergotinine, and although the former contains somewhat less Ergotinine than the latter, it is usually considered the best. Ergot yields its virtues to Water and to Alcohol.

Ergot contains, in addition to the crystalline alkaloid Ergotinine discovered by Tanret, a second alkaloid Ergotoxine discovered by Barger and Carr of the Wellcome Physiological Research Laboratories, and described by them at the British Association meeting at

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* Ergot is common on grasses, and if it occurs in the pastures where cattle feed, it is said to occasion dry gangrene, causing them to lose their hoofs and horns.

York in 1906 (*C.N.* '06, 89; *B.M.J.* '06, ii. 1792). The latter alkaloid, although itself amorphous, forms a number of crystalline salts. It is claimed to be the most important if not the one essential active principle, whilst the pure crystalline Ergotinine is almost if not quite physiologically inactive. Tanret (*J. Pharm. Chemie*, '06 [vi.], 24, 397-403; *J.C.S. Abs.*, '06, i. 979; *Y.B.P.* '07, 62) takes exception to the application of the name Ergotoxine to the amorphous body accompanying crystalline Ergotinine, which he discovered and named amorphous Ergotinine, and also strongly controverts the statement that crystalline Ergotinine is almost physiologically inactive, alleging in support the constant therapeutic employment of the base. Barger and Carr point out (*J.C.S. Trans.* '07, 340) that Tanret himself attributed the variation in the specific rotation of amorphous Ergotinine to varying amounts of crystallised Ergotinine contained in it, and that he therefore had not prepared the pure alkaloid. As to the physiological activity, they refer the reader to the experiments of H. H. Dale, published in the *Jour. Physiol.* '06, 34, 163. According to Barger and Carr (*J.C.S. Trans.* '97, 339), Acetic Anhydride converts the crystalline into the amorphous alkaloid, the change being brought about by the removal of a molecule of Water and not by the introduction of an Acetyl group, and support the suggestion of Kraft's that the amorphous is the Hydrate of the crystalline alkaloid, and this theory is regarded as definitely established by their analysis. Hydroergotinine, discovered independently by Kraft (*J.C.S. Abs.* '06, i. 979), is considered (*J.C.S. Trans.* '07, 341) to be undoubtedly identical with Ergotoxine. Cornutine does not occur as such in Ergot, but is an artificial decomposition product of Ergotinine. The Picrosclerotine of Dragendorff and the Secaline of Jacobi are regarded as other names for Tanret's alkaloid.

Ergot also contains Ergotinic Acid (the Sclerotic Acid of Dragendorff and the Ergotic Acid of Wenzell), Sphacelinic Acid or Sphacelotoxin, Ergosterol, Trehalose, and Mannite. Colouring matters, *e.g.*, Sclererythrin, Scleroiodin, Scleroxanthin and its anhydride Sclerocrystallin, Picrosclerotine, and Fusco-sclerotic Acid, are present, and about 33 p.c. of fixed oil, which can be extracted with Ether, Petroleum Ether, and to a great extent by hydraulic pressure.

Medicinal Properties.—Ecbolic; used in obstetric practice to contract the uterus, assist expulsion of placenta, and prevent or stop post-partum hæmorrhage. Employed in uterine hæmorrhage from other causes, such as fibroid tumour; and in subinvolution of the uterus; also, but with doubtful success, in hæmoptysis, hæmatemesis, hæmaturia, and epistaxis. Efficacious in flatulent dilatation of stomach; in acute myelitis and in paraplegia of inflammatory origin; in night sweats of phthisis. Deep intramuscular **injection** gives most rapid action in critical cases. Injections into the sphincter are valuable in prolapsus ani. After elaborate investigations, Kobert recommends freshly-powdered Ergot for certainty of action.

The uses of this valuable drug have been increased by its employment *L.* '04, ii. 1395) in preventing shock in abdominal surgery. 30 minims of a specially-prepared Ergot, in which from $\frac{1}{60}$th to $\frac{1}{30}$th grain of Strychnine or $\frac{1}{30}$th grain Sparteine is dissolved, are injected three times daily, for two or three days before operation. In chorea 1 to $1\frac{1}{2}$ drm. of the liquid extract with 2 minims of Liquor Strychninæ have been given thrice daily (*B.M.J.* '05, i. 354), or 1 drachm liquid extract and 3 minims of Liquor Arsenicalis.—*B.M.J.* '05, i. 354.

It is this drug which has given the best results (*L.* '05, i. 851), and which seems to solve the difficulty of the treatment of surgical shock. 2 grammes of a specially-prepared Ergot diluted with 20 c.c. of normal saline solution, 5 to 10 c.c. injected at a time. Its great advantage over Adrenalin is that its action is more prolonged, one dose being sufficient to keep up the blood pressure for some time.

The best remedy for intestinal hæmorrhage.—*T.G.* '07, 324.

In hiccough (*L.* '85, ii. 276); in periodic neuralgia (*T.G.* '94, 343); in diabetes insipidus, 30-minim doses of the Liquid Extract every three hours.—*L.M.R.* '80, 231, 446; '81, 12.

In chorea 1-drm. doses of the Liquid Extract given every four hours.—*B.M.J.* '03, ii. 133.

Ammoniated Tincture stated to be an active preparation, and to have proved useful in obstinate cases of uterine hæmorrhage when other Ergot preparations have failed.—*C.D.* '01, i. 324, 663.

Dose.—20 to 60 grains = 1·3 to 4 grammes.

Prescribing Notes.—*The unpleasant taste of the preparations of Ergot is improved by Tincture of Orange and Chloroform Water, or better by Tincture of Orange and Cinnamon Water. The Infusion and Hypodermic Injection should be made fresh as required. When the extract is ordered in pills, Powdered Liquorice Root added q.s. makes a good pill.*

The prescriber has three fluid extracts to choose from: (1) *B.P. which is exhausted by cold Water;* (2) *U.S.P. by diluted Alcohol mixed with Acetic Acid;* (3) *Liquor Ergotæ Ammoniatus* (*not official*) *by Ammoniated diluted Alcohol. The official Tinctura Ergotæ Ammoniata is similar to the last, but much weaker.*

It is often desired to give Iron with Ergot, which produces an unsightly ink-like mixture and a precipitate. This can be avoided by adding 6 *grains of Citric Acid to* 1 *fl. drm. of Tincture of Perchloride of Iron.*

Incompatibles.—Astringents, metallic salts.

Official Preparations.—Extractum Ergotæ, Extractum Ergotæ Liquidum, Infusum Ergotæ, Tinctura Ergotæ Ammoniata. Injectio Ergotæ Hypodermica is made with Extractum Ergotæ.

Not Official.—Discs of Ergotin, Extractum Ergotæ, Extractum Fungi Secalis Fluidum, Extractum Secalis Cornuti, Extractum Secalis Cornuti Cornutino-Sphacelinicum, Fluidextractum Ergotæ, Liquor Ergotæ Ammoniatus, Mistura Ergotæ, Mistura Ergotæ Ammoniata, Mistura Ergotæ et Ferri, Pilula Ergotini, Tinctura Ergotæ, Vinum Ergotæ, Acidum Scleroticum, Cornutine Citrate, Ergotin (various), Ergotinine, Ergot Aseptic, Ergotoxine, Ergotoxine Hydrochloride, Ergotoxine Phosphate.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Ger., Hung., Jap., Norw., Russ., Swed. and Swiss (Secale Cornutum); Fr. (Ergot de Seigle); Ital. (Segala Cornuta); Mex. (Cuernecillo de Centeno); Port. (Cravagem de Centeio); Span. (Cornezuelo de Centeno); U.S. (Ergota).

The *Brussels Conference* agreed that Ergot should be not more than one year old, and kept whole.

Descriptive Notes.—Ergot is the compact horny mycelium or spawn of the small fungus, *Claviceps purpurea*, Tulasne, and is developed on, and takes the place of, the growing ovary of the rye plant. The fungus itself resembles a minute mushroom in shape, without gills, but with cavities containing ascospores, in its cap or head. It cannot be developed from the Ergot of commerce, the vitality of which is destroyed by drying, but can readily be grown on damp sand in spring from the mature but undried Ergot. As met with in commerce Ergot may vary in size according to the variety, but averages about ½ to ¾ of an inch (12 to 19 mm.) and 1 to 2 lines in diameter. The official description limits it to ⅓ to 1½ inch (1 to 4 cm.) in length, but does not give the diameter, which varies from ½ to 4 lines. There are three principal varieties in commerce, viz., Spanish, German or Austrian, and Russian, and occasionally a variety from the Canary Islands. The Spanish is the largest and most highly priced, the German comes next in size, and then the Russian, the Canary kind containing a larger number of small specimens than the Russian. English Ergot is not known in retail commerce; it is probably mixed with the foreign drug in this country, being separated from the cereal by millers. The activity of Ergot appears to depend more upon the method of preservation than upon the particular variety employed.

It should be hard and dry. It is longitudinally furrowed on each side, violet-black externally, and pinkish-white within, with a short fracture often irregularly cracked. Specimens that are flexible have a mouldy odour, and are much cracked, usually due to exposure to damp before drying, or are infested with powder-like mites, should be rejected. If dried over lime or in a current of warm air, and kept in stoppered bottles from which air is excluded by Vaseline around the stoppers, it will keep good for some months, but should only be powdered when required for use. It should not be kept longer than a year (*P.G.* and *U.S.P.*), and should not give off an ammoniacal or rancid odour when 10 parts of boiling Water are poured over it (*P.G.*).

Tests.—Ergot possesses a peculiar and disagreeable odour, and if it be reduced to powder and the powder is moistened with Potassium Hydroxide Solution, this odour is intensified. Good Ergot leaves from 3 to 5 p.c. of ash when ignited with free access of air. Six samples examined in the author's laboratory left from 2·15 to 2·96 p.c., with an average of 2·75 of ash on incineration. The cold Water extract varied from 11·04 to 13·4 p.c., with an average of 12·3 p.c.

Preparations.

EXTRACTUM ERGOTÆ.—Extract of Ergot. *B.P.Syn.*—Ergotin.

100 of Ergot exhausted by percolating with Alcohol (60 p.c.). Evaporate percolate to 25 and mix it with an equal quantity of Distilled Water, filter; add 4·7 of diluted Hydrochloric Acid, and after 24 hours filter, wash the residue in the filter until free from acid; add 2 of Sodium Carbonate to the filtrate mixed with the washings, and evaporate the whole to a soft extract.

Dose.—2 to 8 grains = 0·13 to 0·52 gramme.

The corresponding preparation to this in *B.P.* '85 was prepared from Liquid Extract of Ergot and Rectified Spirit.

Extractum Ergotæ (*U.S.P.*) is practically the same as *B.P.*, except that Glycerin is added towards the end of the process. It is an alcoholic extract of Ergot treated with diluted Hydrochloric Acid to precipitate Sclererythrin, the characteristic colouring matter of Ergot, neutralised with Monohydrated

Sodium Carbonate and evaporated as directed in *U.S.P.* One would gather from the note in the *B.P.C.* that *U.S.P.* employed less than half the *B.P.* quantity of Sodium Carbonate, but this is not so; Sodium Carbonate should read Monohydrated Sodium Carbonate, then the quantities are nearly the same.

Extractum Secalis Cornuti (*Ger.*).—2 of Ergot macerated in 4 of Water, twice, the liquors mixed and evaporated to 1; mixed with 1 of Alcohol (90 p.c.), filtered after 3 days, and evaporated to a thick extract.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex. (Ergotina de Bongean), Norw., Port., Russ., Span., Swed., Swiss and U.S.

The *Brussels Conference* agreed to prepare a watery extract and make up with Alcohol (60 p.c.).

EXTRACTUM ERGOTÆ LIQUIDUM. Liquid Extract of Ergot. *N.O.Syn.*—Extractum Secalis Cornuti Fluidum.

Macerate 20 of crushed Ergot in 100 of Distilled Water for 12 hours, strain; repeat the maceration with a further 50 of Distilled Water and strain, press the marc, strain the fluid, mix it with the other fluid portions and evaporate to 14; when cold add 7½ of Alcohol (90 p.c.) and after one hour filter. (In practice it is better to allow it to stand for several hours.) (1 in 1)

Dose.—10 to 30 minims = 0·6 to 1·8 c.c.

60 minims = 3·6 c.c., is not infrequently prescribed.

Tests.—Liquid Extract of Ergot has a specific gravity of 1·015 to 1·025; contains from 13 to 16 p.c. w/v of total solids and about 32 p.c. w/v of Absolute Alcohol.

Fluidextractum Ergotæ (*U.S.P.*).—Percolate 100 of Ergot (in No. 60 powder) with 2 of Acetic Acid (*U.S.P.*) mixed with 98 of Alcohol (49 p.c.); continue the percolation with Alcohol (49 p.c.) until exhausted; reserve the first 85, evaporate the remainder to a soft extract, dissolve this in the reserved portion and make up to 100 with Alcohol (49 p.c.).

Foreign Pharmacopœias.—Austr. (Extractum Fungi Secalis Fluidum). The fat is extracted from 100 of Ergot with Petroleum Ether, and after drying the marc, it is percolated with a mixture of Glycerin 5, Alcohol 20, Water 20, to produce 100; Belg., Dan., Ger., Norw., Swed. and Russ., Extract with **Hydrochloric Acid** and dilute Alcohol; Fr., exhausted with Water, and Tartaric Acid; Mex. (Extracto Fluido de Curnecillo de Centeno), with **Acetic Acid** and dilute Alcohol; Swiss and U.S. percolated with dilute Alcohol acidified with **Acetic Acid**; Dutch, with dilute Alcohol and Tartaric Acid; Jap., with a mixture of Alcohol 2, Water 8. Not in the others.

The *Brussels Conference* agreed that the strength should be 100 p.c.

INFUSUM ERGOTÆ. Infusion of Ergot.

Infuse 1 of freshly crushed Ergot with 20 of boiling Distilled Water for 15 minutes and strain.

Dose.—1 to 2 fl. oz. = 28·4 to 56·8 c.c.

Used also as an injection for gleet.

INJECTIO ERGOTÆ HYPODERMICA. Hypodermic Injection of Ergot. *B.P.Syn.*—Hypodermic Injection of Ergotin.

Extract of Ergot, 100 grains; Phenol, 3 grains; Distilled Water, 220 minims, or a sufficient quantity. Mix the Phenol with the Distilled Water; boil for a few minutes; cool; add the Extract of

Ergot, and, if necessary, sufficient recently boiled and cooled Distilled Water to produce 330 minims of the Injection. (1 in 3)

The above is the official wording, but it is not clear why the Water should be boiled *after* the addition of the Phenol. It would be better to dissolve both the Ergot and the Phenol in the previously Sterilised Water.

Dose, *by subcutaneous injection.*—3 to 10 minims = 0·18 to 0·6 c.c.

This injection should be recently prepared. 3·3 minims = 1 grain of Extract of Ergot.

Foreign Pharmacopœias.—Official in Port. (Soluto de Ergotino com Glycerino), Ergotin 1, Glycerin 4, Water 5; all by weight; Span. (Inyeccion Hipodermica de Ergotina), Ergotin 1 gramme, Glycerin 2 grammes, Water *q.s.* to 10 c.c. Mex. and Span. have Injection Ergotinine.

TINCTURA ERGOTÆ AMMONIATA. AMMONIATED TINCTURE OF ERGOT.

Ergot, in No. 20 powder, 5; Solution of Ammonia, 2; Alcohol (60 p.c.), *q.s.* to yield 20. (1 in 4)

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

Foreign Pharmacopœias. A simple tincture is official in Dutch, Mex. and Port., 1 in 5; all by weight. Not in the others; U.S. (Vinum Ergotæ), 1 in 5.

Tests.—Ammoniated Tincture of Ergot has a specific gravity of 0·930 to 0·938; contains from 3 to 5 p.c. of total solids and about 52 p c. w/v of Absolute Alcohol.

Not Official.

DISCS OF ERGOTIN $\frac{1}{3}$ grain = 0·02 gramme, and $\frac{1}{4}$ grain = 0·016 gramme are prepared for hypodermic use.

PILULA ERGOTINI.—Ergotin 2 grains, Liquorice Powder 3 grains.

LIQUOR ERGOTÆ AMMONIATUS.—A liquid Extract of Ergot (1 in 1), prepared with ammoniated diluted Alcohol.

Dose.—10 to 60 minims = 0·6 to 3·6 c.c.

B.P.C. gives the following formula, under the title **Extractum Ergotæ Ammoniatum Liquidum,** but adds that although four times the strength of the official tincture, it is not very active:—100 of Ergot in No. 20 powder is percolated with a mixture of Solution of Ammonia 10, and Alcohol (60 p.c.) 70; continue the percolation with Alcohol (60 p.c.) until exhausted; reserve the first 85, evaporate the remainder to 15 and mix.

MISTURA ERGOTÆ.—Liquid Extract of Ergot, 30 minims; Diluted Sulphuric Acid, 10 minims; Chloroform Water, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

Liquid Extract of Ergot, 30 minims; Syrup of Ginger, 30 minims; Infusion of Orange Peel, to $\frac{1}{2}$ fl. oz.—*London.*

MISTURA ERGOTÆ AMMONIATA.—Liquid Extract of Ergot, 20 minims; Ammonium Carbonate, 3 grains; Emulsion of Chloroform, 15 minims; Camphor Water, to 1 fl. oz.—*University.*

Liquid Extract of Ergot, 4; Ammonium Carbonate, $\frac{5}{8}$; Emulsion of Chloroform, 3; Camphor Water, *q.s.* to produce 100.—*B.P.C. Supplement.*

MISTURA ERGOTÆ ET FERRI.—Liquid Extract of Ergot, 30 minims; Solution of Ferric Chloride, 15 minims; Citric Acid, 5 grains; Chloroform Water, to 1 fl. oz.—*Guy's.*

TINCTURA ERGOTÆ.—Ergot, 5; Proof Spirit, 20.—*B.P.* 1885.

This has been incorporated in the *B.P.C.*

VINUM ERGOTÆ.—Fluid Extract of Ergot, 20; Alcohol (95 p.c.), 5; White Wine, 75.—*U.S.P.*

This has been incorporated in the *B.P.C.*, using Detannated Sherry.

ACIDUM SCLEROTICUM.—A weak acid principle obtained from Ergot by Dragendorff. It is used **hypodermically** $\frac{1}{3}$ to $\frac{3}{4}$ grain = 0·021 to 0·05 gramme, dissolved in Distilled Water or Thymol Water.

CORNUTINE CITRATE.—A soluble salt of an alkaloid which is stated by Kobert to be the active principle of Ergot. A brown powder, which is used in obstetric practice.

Dose. $\frac{1}{12}$ to $\frac{1}{6}$ grain = 0·0054 to 0·01 gramme, or subcutaneously $\frac{1}{32}$ to $\frac{1}{8}$ grain = 0·002 to 0·008 gramme.

Given in $\frac{1}{100}$ grain hypodermically to contract uterus in a case of eclampsia. —*L.* '99, i. 1430.

A soluble **Cornutine Hydrochloride** has also been prepared.

ERGOTININE.—An alkaloid obtained from Ergot. Long white crystals which have a tendency to darken on exposure to light and air.

Solubility.—According to Barger and Carr 1 part by weight of Ergotinine dissolves in 312 parts by weight of Absolute Ethyl Alcohol at 10° C. (50° F.) and in 292 parts by weight at 18° C. (64·4° F.). It is soluble 1 in 1020 parts by weight of Absolute Ether, 1 in 91 parts by weight of Ethyl Acetate, 1 in 26 parts by weight of Acetone, 1 in 77 parts by weight of boiling Benzene, 1 in 52 parts by weight of boiling Ethyl Alcohol, and 1 in 56 parts by weight of boiling Methyl Alcohol. It is stated by these authors to be extremely soluble in cold Chloroform, moderately so in Amyl Alcohol or Xylene, and insoluble in Petroleum Ether.

These figures also appear in the *B.P.C.*, but the abstractor has failed to note that all the fluids are by weight, and not by measure; and '1 in 91 parts by weight of Ethyl Alcohol' has been incorrectly copied as '1 in 91 by volume of Ethyl Acetate.'

Foreign Pharmacopœias.—Official in Fr. (Ergotinine Cristallisée), Span. and Mex.

Tests.—Ergotinine melts according to Barger and Carr at 229° C. (444·2° F.). Its solution in Ethyl Alcohol is strongly dextrogyrate, the rotation of a saturated solution in this solvent at 10° C. (50° F.) being + 338°, but the rotation is effected by prolonged boiling.

Ergotinine is precipitated by the usual alkaloidal reagents such as Potassio-mercuric Iodide Solution, Iodo-potassium Iodide Solution, Gold Chloride Solution, Platinum Chloride Solution, Bromine Water, Tannic Acid Solution and Picric Acid Solution. The addition of concentrated Sulphuric Acid to a solution of Ergotinine in Ether or in Ethyl Acetate produces a transitory orange coloration changing to blue. When the alkaloid is dissolved in concentrated Sulphuric Acid and a little anhydrous Ferric Chloride is added, a pale yellow coloration passing through orange, crimson and green to a permanent dark blue is produced.

A soluble **Ergotinine Citrate** has also been prepared.

ERGOTOXINE.—This alkaloid was discovered by Barger and Carr, and is described by them as a light white powder.

Solubility.—It is more soluble in organic solvents than Ergotinine, notably in cold Alcohol. It is also soluble in Sodium Hydroxide solution. It is but slightly soluble in Ether.

Tests.—Ergotoxine, according to the above-named authors, begins to soften about 155° C. (311° F.) and gradually melts at 162° to 164° C. (323·6° to 327·2° F.). The rotation of an alcoholic solution varies with the method of preparation. Ergotoxine is precipitated by the usual alkaloidal reagents, *e.g.*, Potassio-mercuric Iodide Solution, Iodo-potassium Iodide Solution, Auric Chloride Solution, Platinic Chloride Solution, Picric Acid Solution, Phosphomolybdic Acid, Bromine Water and Tannic Acid Solution. The addition of Concentrated Sulphuric Acid to a solution of Ergotoxine in Ethyl Acetate or Ether gives rise to a transitory orange coloration, changing to blue. The addition of anhydrous

Ferric Chloride to a trace of the alkaloid dissolved in concentrated Sulphuric Acid gives a pale yellow coloration changing through orange, crimson and green to a permanent dark blue.

ERGOTOXINE HYDROCHLORIDE.—This salt was prepared by Barger and Carr, and is described by them as forming minute diamond-shaped plates, and very thin and very long square-ended needles. It melts at 205° C. (401° F.). It is considered very unstable and therefore very difficult to purify.

ERGOTOXINE PHOSPHATE.—This salt is described as the most easily purified of the Ergotoxine salts; it is stated to crystallise in groups of needles, and when pure in isolated needles.

Solubility.—Barger and Carr state that 1 part of Ergotoxine Phosphate dissolves in 313 parts by weight of cold, and in 14 parts by weight of boiling Alcohol (90 p.c.).

Tests.—Ergotoxine Phosphate melts according to the above-named authors at 186° to 187° C. (366·8° to 368·6° F.). A 1 p.c. solution of the salt in cold Distilled Water forms a typical colloidal solution. If an equal volume of Normal Volumetric Hydrochloric, Oxalic, Phosphoric, or Acetic Acid Solutions are added to the solution, the degree of precipitation is in the order named, the Hydrochloric Acid forms a thick jelly, so that the tube can be inverted without the contents escaping, whilst in the case of the Acetic Acid, the solution remains fluid.

A normal and an acid **Ergotoxine Oxalate** have been prepared by Barger and Carr, the former described by them as elongated rectangular plates possessing a melting point of 179° C. (354·2° F.), the latter as minute prisms possessing a similar melting point.

ERGOTIN.—This is a synonym for *B.P.* Extract of Ergot; there are also the following commercial varieties:—

Ergotinum Bonjean.—An aqueous reddish-brown Extract, purified by Alcohol. 1 part Extract = 5 to 6 parts Ergot.

Dose.—1½ to 4½ grains = 0·1 to 0·3 gramme.

Ergotinum Bonjean Depuratum pro Injectione.—A purified liquid for injection, 1½ parts = 1 part Ergotin Bonjean.

Dose.—1½ to 4½ grains = 0·1 to 0·3 gramme.

Ergotin Bombelon Fluidum (Cornutinæ Ergotas).—A brownish-black liquid.

Dose.—30 minims = 1·8 c.c. per os, 3½ to 8 minims = 0·2 to 0·5 c.c. subcutaneously.

Ergotin Bombelon Spissum.—Soft Extract. Administered internally in Pill form or in Solution. Ergot Bombelon Spissum, 10 grammes (or 154 grains); Aqua Laurocerasi, 7·5 grammes (or 2 fl. drm.); Alcohol (90 p.c.), 2·5 grammes (or 42 minims); 4 to 15 drops.

Ergotinum Denzel Fluidum.—A purified Extract.

Dose.—3 to 10 grains = 0·2 to 0·65 gramme.

Ergotinum Kohlmann Fluidum.—Brownish-black fluid, miscible with Water.

Daily Dose.—60 to 75 grains = 4 to 5 grammes.

Ergotinum Purum Dialysatum Wernich Spissum.—A dialysed aqueous Extract of Ergot, purified by treatment with Ether and Alcohol. Soluble in Water.

Dose.—10 to 30 grains = 0·65 to 2 grammes.

Ergotinum Purum Dialysatum Wernich Fluidum.—2 parts = 1 part of the above preparation.

Dose.—10 to 60 grains = 0·65 to 4 grammes.

Ergotinum Purum Dialysatum Wernich Siccum.

Dose.—22 grains = 1·4 gramme.

Ergotinum Purum Siccum Wiggers.—A reddish-brown powder, soluble in Water.

Dose.—⅓ to 1½ grain = 0·02 to 0·1 gramme.

Ergotin Yvon.—A brownish-black fluid, prepared from fat-free Ergot by exhaustion with dilute Tartaric Acid solution.

Dose.—10 to 20 drops internally per os; 1 c.c. = 16 minims hypodermically.

EXTRACTUM SECALIS CORNUTI CORNUTINO-SPHACELINICUM (KOBERT).—An Extract which combines the action of **Cornutine** and **Sphacelinic Acid**, an alkaloid and a resinous body, obtained by Kobert from Ergot. It is prepared by exhausting Ergot with strong Alcohol, and evaporating the liquid to an Extract, the fatty Oil being removed by Ether.

ERGOT ASEPTIC.—A sterilised concentrated preparation prepared from physiologically standardised Ergot, put up in bulbs containing 1 c.c. representing 2 grammes or 30 grains Ergot.

Not Official.

ERIGERONTIS CANADENSIS OLEUM.

OIL OF CANADIAN FLEABANE.

A colourless, or pale yellow, mobile liquid, distilled from the fresh flowering Herb *Erigeron Canadense*, L., which grows abundantly in American Mint fields.

It has a tendency to darken in colour and to become viscid on exposure to air, and rapidly becomes resinified. It should be kept in well-stoppered glass bottles of a dark amber tint, in a cool atmosphere and protected as far as possible from the light.

It consists almost entirely of Dextro-limonene.

Medicinal Properties.—Diuretic, tonic, and astringent. Chiefly employed for arresting internal hæmorrhage.

Dose.—5 to 10 minims = 0·3 to 0·6 c.c. every two or three hours.

Foreign Pharmacopœias.—Official in U.S. Not in the others.

Tests.—Erigeron Oil has a specific gravity of 0·850 to 0·870, an optical rotation of not below + 45°, and the greater part of the oil distils about 175° C. (347° F.). It should be soluble in an equal volume of Alcohol (94·9 p.c.).

Not Official.

ERYTHROL TETRANITRATE.

TETRANITRIN.

A colourless, crystalline solid melting at 61° C. (141·8° F.) prepared from Erythrol (a tetratomic Alcohol). When kept in a dark and moderately cool place it is fairly stable, but if exposed to warmth, and especially sunlight, it rapidly undergoes decomposition. It is liable to explode on percussion, and should be handled with great care.

It is but slightly soluble in Water, but dissolves readily in Alcohol (90 p.c.) and in Ether.

It is a vaso-dilator and belongs to the group of which Glycerol Trinitrate (Nitroglycerin) may be regarded as the typical representative. Blood pressure experiments show that it has a less marked but more prolonged action than that substance.—*B.M.J.* '95, ii. 1213; '97, i. 907; '98, i. 18, 37, 248; ii. 936.

A list of cases treated with Erythrol Tetranitrate.—*B.M.J.* '99, ii. 1259. Dangers.—*M.P.* '99, 338.

Dose.—½ to 1 grain, in alcoholic solution or in the form of **tablets**.

Tablets are made containing ⅕, ¼, ½ and 1 grain.

Not Official.

ERYTHROPHLÆUM.

CASCA BARK. SASSY BARK.

The Bark of the *Erythrophlæum guineense*, Don. Introduced as a cardiac tonic in 1877.

An Ordeal Bark used in West Africa. It yields an alkaloid **Erythrophlæine**, the **Hydrochloride** of which is soluble in Water.

B.P.C. Formulary 1894 had a **Tincture** (1 in 10), dose 5 to 10 minims = 0·3 to 0·6 c.c., but it was omitted from the 1901 edition; it is now re-introduced in *B.P.C.* 1907.

ETHYL NITRITIS LIQUOR.

See under SPIRITUS ÆTHERIS NITROSI.

EUCAINE. *See* COCAINE, p. 413.

EUCALYPTI GUMMI.

EUCALYPTUS GUM.

A ruby-coloured exudation, or so-called Red Gum, from the bark of *Eucalyptus rostrata* and some other species of Eucalyptus. Imported from Australia.

Under the name of Gummi Rubrum, this has been 'Not Official' in the *Companion* since 1871.

Medicinal Properties.—Astringent, principally used in diarrhœa, dysentery, and relaxed throat.

This Gum adheres with great pertinacity to the mucous surfaces, and it is probably on this account that its astringency is more effective than that of Catechu, Kino, etc., although it contains less astringent matter.

The **Fluid Extract** is an excellent styptic; injected into the nostril, at once stays bleeding of the nose; a tablespoonful in a pint of Water forms an astringent **injection** for the vagina or rectum; it also forms an astringent **lotion** for the eyes.

Dose.—2 to 5 grains = 0·13 to 0·32 gramme.

Prescribing Notes.—*Given in the form of* **cachets** *or in* **pills** *massed with Dispensing Syrup q.s. The Tincture mixes with Water and does not require Mucilage.*

Official Preparation.—Trochiscus Eucalypti Gummi.

Not Official.—Extractum Gummi Rubri Liquidum, Extractum Eucalypti Gummi Liquidum, Suppositoria Gummi Rubri, Syrupus Gummi Rubri, Syrupus Eucalypti Rostratæ, Syrupus Eucalyptus Compositus, Tinctura Gummi Rubri, Tinctura Eucalypti Gummi, Trochiscus Eucalypti Compositus, Trochiscus Gummi Rubri (*Squire*).

Descriptive Notes.—Although one variety of Eucalyptus Kino is known as Red gum in commerce, it is incorrectly styled gum in the *B.P.* and indeed it is often called in retail commerce by the more appropriate name of Eucalyptus Kino. The *B.P.* states that it is obtained from the bark of *Eucalyptus rostrata*, Schlecht., and some other species. The one named in the *B.P.* is unfortunately a species which does not yield the best kind. According to Mr. H. G. Smith (*P.J.* (4), 23, p. 101) *Eucalyptus calophylla*, R. Br., yields the best obtainable in commercial quantities, the kino of *E. rostrata* being not so astringent, and its Tincture gelatinises. Eucalyptus kinos contain two tannins, one giving a green colour with Ferric Chloride, and not gelatinising, and the other giving a purple colour and gelatinising when kept (*See Proc. Roy. Soc. N.S. Wales, June and Aug.*, 1904). The fragments or grains are described in the *B.P.* as transparent and ruby red, somewhat tough, adhering to the teeth and tinging the saliva red. It should be soluble to the extent of 80 to 90 p.c. in cold Water and almost entirely in 90 p.c. Alcohol. The Eucalyptus kino of commerce is often blackish and opaque and consists of the natural product of the trees, but there is a preparation obtainable which is made in Australia by boiling down the fresh juice collected from incisions made in the bark of the tree. This is usually distinguished under the name of 'red gum' in commerce and the *B.P.* characters apply to it. The tincture does not gelatinise. It is used especially in 'red gum' lozenges on account of its purity and ready solubility. Eucalyptus Gum or Kino that is allowed to dry on the tree or is picked out of the wood is often largely insoluble in Water, owing apparently to the action of an oxydase which is only destroyed by boiling.

Preparation.

TROCHISCUS EUCALYPTI GUMMI.—EUCALYPTUS GUM LOZENGE.

1 grain of Eucalyptus Gum, in each, with Fruit basis.

Not Official.

EXTRACTUM GUMMI RUBRI LIQUIDUM.—Red Gum, 7; Water, 21 dissolve, strain, and add Alcohol (90 p.c.), 1.

Dose.—30 to 60 minims = 1·8 to 3·6 c.c., in a wineglassful of Water.

EXTRACTUM EUCALYPTI GUMMI LIQUIDUM.—Dissolve 5 of Red Gum in 13 of Distilled Water; strain, and add 2 of Alcohol (90 p.c.) and sufficient Distilled Water to produce 20.

This has been incorporated in the *B.P.C.* from the *B.P.C. Formulary* 1901.

SUPPOSITORIA GUMMI RUBRI.—Powdered Red Gum, 5 grains; Extract Nux Vomica, 1 grain; Cocoa-nut Stearin, *q.s.* to make one suppository.

SYRUPUS GUMMI RUBRI.—Liquid Extract, 20; Sugar, 12; dissolve.

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

This has been incorporated in the *B.P.C.* under the title **Syrupus Eucalypti Gummi.**

SYRUPUS EUCALYPTI ROSTRATÆ.—Red Gum of *Eucalyptus rostrata*, 800 grains; Boiling Distilled Water, 9½ oz.; Refined Sugar, 16 oz.; Oil of Eucalyptus, 30 minims; Mucilage of Acacia, 4 fl. drm.—*Pharmacy Board of Victoria* (*C.D.* '06, i. 110).

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

This has been incorporated in the *B.P.C.* with slight alteration of the quantities as follows:—

Syrupus Eucalypti Compositus.—Eucalyptus Gum from *Eucalyptus*

Rostrata, 7½; Oil of Eucalyptus, ¼; Refined Sugar, 60; Mucilage of Gum Acacia, 2; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

TINCTURA GUMMI RUBRI.—Gum, 1; Alcohol (90 p.c.), 4; digest and strain. Mixes with Water without becoming turbid.

Dose.—20 to 40 minims = 1·2 to 2·4 c.c.
1 part of this with 6 or 8 of Water for a **gargle.**

Tinctura Eucalypti Gummi (*B.P.C.*)—Eucalyptus Gum, 25; Alcohol (45 p.c.), *q.s.* to make 100.

TROCHISCUS EUCALYPTI COMPOSITUS.—2 grains of Potassium Chlorate, ¼ grain of Powdered Cubebs and 1 grain of Red Gum in each.—*Throat.*

TROCHISCUS GUMMI RUBRI (*Squire*).—Made with Rose Paste. This lozenge, which has been in use for about forty years, differs in appearance and flavour from that now introduced into the *B.P.*

Useful for relaxed throat. They have also been recommended as a preventive of sea-sickness.

EUCALYPTI OLEUM.

OIL OF EUCALYPTUS.

A colourless, or pale yellow, oily, limpid liquid, having a characteristic aromatic odour. It should contain at least 50 p.c. of Eucalyptol, and but very little Phellandrene. It is the volatile Oil distilled from the fresh Leaves of *Eucalyptus globulus*, and other species of *Eucalyptus.*

For many years the Oil from *E. amygdalina* was the most esteemed variety, and was included in *B.P.* '85, but it is now excluded by the tests given in *B.P.* '98.

The chief constituent of the Oil is Eucalyptol (Cineol), which in good Oils amounts to from 50 to 70 p.c. It also contains the Terpene, Dextro-pinene, in the crude Oil various Aldehydes, principally Valeric, Butyric, and Capronic Aldehydes, and in the higher boiling point fraction a lævogyrate Ester, yielding on saponification a lævogyrate Alcohol.

Solubility.—3 in 1 (or less) of Alcohol (90 p.c.), in all proportions of Absolute Alcohol; 1 in 38 of Alcohol (60 p.c.), (Amygdalina Oil, 1 in 175).

These figures have been incorporated in the *B.P.C.*

Medicinal Properties.—It is a powerful antiseptic and deodoriser; antipyretic. It is used as an inhalation in cases of pulmonary gangrene, phthisis, influenza, and coryza; and internally or by inhalation to relieve the cough in chronic bronchitis, phthisis, and asthma. Mixed with Iodoform as an application to hard and soft chancres, and as urethral suppository in gonorrhœa. Given internally for chronic inflammation of the bladder.

The following prescription of Sir R. Douglas Powell (*Edin. Med. Jour.* '05, 465) is of great service in relieving the troublesome cough of phthisis; Eucalyptus or Pine Oil, 3 drm.; Oil of Bitter Almonds, 1 drm; Spirits of Chloroform (double strength), 1 oz. Ten to 15 drops to be inhaled after the first morning coughing, in the middle of the day, and in the evening.

Alarming symptoms (*L.* '05, ii. 963) following the internal administration of a teaspoonful of the oil, taken plain to relieve an ordinary cold. Recovery.

A case of poisoning by Eucalyptus Oil. Recovery.—*B.M.J.* '06, i. 1085.

With Chloroform very successful in ankylostomiasis; also in killing tape- and thread-worms.—*L.* '06, i. 285.

Inhalation in whooping-cough.—*B.M.J.* '86, i. 430. As a disinfectant, as a throat and nose spray, and as an inunction in scarlet fever.—*L.* '95, i. 861.

An infusion (60 grains in 6 oz. of the leaves) twice daily in the treatment of diabetes.—*B.M.J.* '02, i. 1295; ii. 1884; *P.J.* '02, ii. 113.

Dose.—½ to 3 minims = 0·03 to 0·18 c.c.

Prescribing Notes.—*Given in the form of emulsion with Mucilage of Acacia and Water, or taken on Sugar. Used as an* **inhalation** *or* **spray.** *May be mixed with equal parts of Olive Oil for a* **liniment**; 1 *to* 3 *or* 4 *of Olive Oil as an antiseptic inunction in scarlet fever.*

Official Preparation.—Unguentum Eucalypti.

Not Official.—Fluidextractum Eucalypti, Tinctura Eucalypti, Eucalyptus Gauze, Eucalyptus Wool and Lint, Pastille of Eucalyptus, Pastille of Eucalyptol, Nebula Eucalypti, Nebula Eucalypti et Pini, Nebula Eucalypti et Menthol et Cocainæ, Parogenum Eucalyptolis, Pessus Eucalypti, Vapor Eucalypti, Vasolimentum Eucalyptoli, Eugol, Eucalypteol, Eucalyptol, Phellandrene, Oleum Eucalypti Maculatæ var. Citriodora, Eudesmol.

Foreign Pharmacopœias.—Official in Fr. (Essence d' Eucalyptus), sp. gr. 0·910 to 0·930; Hung., sp. gr. 0·914; Jap., sp. gr. not given; Mex. (Aceite Volatil de Eucalipto), sp. gr. 0·905; Norw., sp. gr. 0·915 to 0·925; U.S., sp. gr. 0·905 to 0·925 at 25° C. (77° F.). Not in the others. The Leaves are official in Belg., Dutch, Fr., Hung., Ital., Jap., Mex., Port., Span., Swiss and U.S.

Descriptive Notes.—The Eucalyptus Oil of commerce is derived chiefly from *E. globulus*, Labill. in Tasmania and California, etc., and from *E. amygdalina*, Labill., *E. cneorifolia*, DC., *E. dumosa*, A. Cunn., and *E. oleosa*, F.v.M., in South Australia.

The oil of *E. amygdalina* was that originally used in medicine in Australia. It has not the Cummin flavour and odour due to Aromadendral which characterises the last three. The oil of *E. globulus* unless rectified has an unpleasant odour. Most of the oils of commerce have been rectified to free them from irritating Alcohols and Aldehydes and colouring matter, but will, nevertheless, if kept with access of air in bottles half full, in course of time resinify and thicken. Oil of *E. globulus*, adulterated with Castor Oil, has been met with in commerce.

Tests.—Eucalyptus Oil has a specific gravity, according to Baker and Smith, from 0·900 to 0·925; the official figures are 0·910 to 0·930; the *U.S.P.* gives 0·905 to 0·925 at 25° C. (77° F.). The Report of the Committee of Reference in Pharmacy suggests that the specific gravity should be raised to 0·910. It is difficult to gauge what this means, as the minimum specific gravity is already given as 0·910. The optical rotation in a tube of 100 mm. is officially required to be from + 10° to − 10°. The *B.P.* does not include a process for the quantitative determination of the Eucalyptol (Cineol), but contents itself with the statement that it should become semi-solid on being stirred, when cold, with a third or half its volume of Phosphoric Acid (sp. gr. 1·75). It must be conceded that the methods available for the quantitative determination of Eucalyptol in Eucalyptus Oils are not strictly accurate. The Phosphoric Acid method for all practical purposes is sufficiently accurate to enable the comparative values of the oils to be judged. The method has been found most useful in arranging the several members of the genus into groups.

The Phosphoric Acid method for the determination of Eucalyptol in Eucalyptus Oils was originally discovered by Mr. L. R. Scammell, of Adelaide, South Australia, in 1892, and was the outcome of an investigation on various samples of cheap oils then being placed on the market. For about two years the process was used by Messrs. Faulding and Co. for the manufacture of Eucalyptol which they shipped to England. In 1894 the process was patented by Mr. Scammell, as Faulding's Process in England, France, Germany, and America, as well as in the Australian Colonies. With this method available, it was possible to introduce a standardised oil containing a guaranteed quantity of Eucalyptol.

The method adopted was to prepare the Eucalyptol Phosphate in a perfectly dry powdery condition by repeatedly pressing it between fresh absorbent paper, well breaking up the cake between each pressing, until finally no moisture could be detected. Eucalyptol Phosphate thus prepared was weighed in the tared vessel in which it was to be decomposed, and from which evaporation of the Eucalyptol was not possible. Cold Water was then added, and sufficient time allowed for the Phosphate to be perfectly decomposed without heating, usually over night. The whole was then transferred to a narrow burette, graduated in $\frac{1}{10}$ of a c.c. The aqueous portion was then separated, and this, together with the warm Water used in washing the Eucalyptol, transferred to a 100 c.c. flask. When the Eucalyptol had cooled down to the room temperature, it was measured, the remaining Water run into the flask, the Eucalyptol passed through a dry filter, and the specific gravity taken, from which the weight of the Eucalyptol was calculated. The dilute acid in the flask was then made up to the mark, and 10 c.c. titrated with Semi-normal Sodium Hydroxide Solution, using Phenolphthalein Solution as indicator, and checking the results by a Lead determination.

To obtain good results with the Phosphoric Acid method, it was found necessary to keep the temperature of the bath as low as possible, using iced Water if necessary, and to add the acid slowly by drops, well incorporating it with the oil. As the compound became solid it was well broken up with the rod, and ample time given for complete crystallisation to take place. Excess of Phosphoric Acid was used over that required theoretically, assuming the richest oil to contain about 73 p.c. of Eucalyptol; the determinations were made upon 10 grammes of oil.

The Phosphoric Acid method of determination is adopted by the *U.S.P.*, and a description of the process will be found under Oil of Cajuput, p. 279. An alternative method of determination is by means of Hydrobromic Acid. Absolutely anhydrous gaseous Hydrobromic Acid is passed through a measured quantity of 10 c.c. of the oil dissolved in 40 c.c. of Petroleum Ether and maintained at a freezing temperature, until a precipitate is no longer formed. The white precipitate of Cineol Hydrobromide is transferred to a pressure filter and washed with cold Petroleum Ether. The filtrate and washings are further treated with Hydrobromic Acid, any precipitate being separately collected and added to the bulk precipitate. The Petroleum Ether is removed from the Cineol Hydrobromide by allowing it to remain for a quarter of an hour in a vacuum. It should then be rinsed with a little Alcohol into a Cassia flask and decomposed with Water. The Cineol is brought into the graduated neck of the flask and the volume read off. The figure so obtained multiplied by 10 yields the percentage by volume present in the oil. Schimmel & Co. consider the Phosphoric Acid method unreliable and useless, and give a caution against its adoption. They are also of opinion that the Hydrobromic Acid cannot lay claim to reliability either, and suggest Resorcin as suitable substance for making the determination. A measured quantity of 10 c.c. of the oil is mixed in a Cassia flask with sufficient 50 p.c. Resorcin Solution to about four-fifths fill the flask. After being thoroughly shaken for 5 minutes, the uncombined oily portions are brought into the neck of the flask by adding a further quantity of the Resorcin Solution, and the volume read off. The figure multiplied by 10 yields the percentage by volume of oily constituents other than Eucalyptol (Cineol), the latter being determined by difference. Oils very rich in Cineol require to be diluted beforehand with an equal volume of Turpentine Oil in order to prevent crystallisation of the Cineol Resorcin.

It is pointed out (*C.D.* '08, i. 55) that within certain limits the Phosphoric Acid method proposed by Scammell gives very fair results. It is that usually adopted for the determination of Cineol. The Resorcin process is dealt with in the same reference, the opinion expressed being that it gives very disappointing results, an oil showing a Cineol content of 65 p.c. w/v by the Phosphoric Acid method indicating 82 p.c. w/v by the Resorcin method, whilst samples of Cajeput oils showing 48 to 52 p.c. w/v by the Phosphoric Acid, indicated 80 to 84 p.c. w/v by the Resorcin method. Until further important information is forthcoming, the new process cannot be accepted as giving even approximate results.

The objections to the Resorcin process recorded *C.D.* '08, i. 55, have been acknowledged (*C.D.* '08, i. 265) by Wiegand and Lehmann of Schimmel's laboratory, who state that the error is due to the influence of the terpenes and other bodies in the oil which do not distil between 170° and 190° C. (338° and 374° F.). The process originally recommended has been modified so as to permit of its use for the estimation of Cineol. 100 c.c. of the oil are distilled from a Ladenburg 3-bulb flask, in such a manner that approximately 1 drop passes over every second. The Cineol content of the principal fraction boiling between 170° and 190° C. (338° and 374° F.), is then determined in the manner described above in detail. The Cineol content ascertained in the fraction is then re-calculated for the original oil, and the total content in p.c. by volume is thus obtained.

The *U.S.P.* requires the oil to contain not less than 50 p.c. w/v of Cineol. The inclusion in the *B.P.* of an assay process indicating not less than 55 p.c. of Eucalyptol has been recommended. Phellandrene, if present in the oil, may be detected by mixing the sample with twice its volume of Glacial Acetic Acid and a saturated solution of Sodium Nitrite. If Phellandrene be present, a crystalline mass will be formed.

Preparation.

UNGUENTUM EUCALYPTI. EUCALYPTUS OINTMENT.

Oil of Eucalyptus (by weight), 1; Hard Paraffin, 4; Soft Paraffin, White, 5.

Now 1 in 10 instead of 1 in 5.

The Leaves and Oil of *E. amygdalina* are recommended by Bosisto for making the ointment.

Not Official.

FLUIDEXTRACTUM EUCALYPTI (*U.S.*).—Eucalyptus in No. 40 powder, 100; percolate with a mixture of Alcohol (95 p.c.), 75, and Water, 25; reserve the first 90 and evaporate the remainder to a soft extract, dissolve this in the reserved portion, and add enough menstruum to produce 100.

TINCTURA EUCALYPTI.—Eucalyptus Leaves, in No. 20 powder, 1; Alcohol (60 p.c.), to percolate 5, *B.P.C.* The *B.P.C. Formulary* of 1901 employed Alcohol 90 p.c.; the foreign Pharmacopœias use an intermediate strength. *U.S.P.* fluid extract about 70 p.c. Alcohol.

Dose.—15 to 120 minims = 0·9 to 7·1 c.c.

Foreign Pharmacopœias.—Official in Belg., Dutch, Fr., Hung., Ital., Mex., Port., Span. and Swiss, 1 in 5; Dutch, Hung. and Swiss with Alcohol (70 p.c.); Belg., Ital. and Mex. with Alcohol (80 p.c.). Not in the others.

Eucalyptus Gauze contains about 6 p.c. of the Oil; **Eucalyptus Wool and Lint** 5 p.c. and 10 p.c.; **Pastille of Eucalyptus** containing 1 minim of Oil is made, also **Pastille of Eucalyptol** containing ½ minim of Eucalyptol, and both of these with Cocaine $\frac{1}{20}$ grain of the Hydrochloride, also the above with $\frac{1}{20}$ grain of Menthol in each.

NEBULA EUCALYPTI.—Oil of Eucalyptus, 20 minims; Liquid Paraffin, to 1 fl. oz.—*Throat.*

Oil of Eucalyptus, 1; Liquid Paraffin, *q.s.* to produce 20.—*B.P.C.*

Nebula Eucalypti et Pini.—Oil of Eucalyptus, 5; Oil of Pine, 7·5; Liquid Paraffin, *q.s.* to produce 100.—*B.P.C.*

Nebula Eucalypti et Mentholis et Cocainæ.—*See* p. 405.

PESSUS EUCALYPTI.—Oil of Eucalyptus, 15 minims; Oil of Theobroma, to 2 fl. drm.

VAPOR EUCALYPTI.—Oil of Eucalyptus, 20 minims; Light Magnesium Carbonate, 10 grains; Water, to 1 fl. oz. Mix a teaspoonful in a pint of Water at 140° F. for each inhalation.—*Throat.*

This has been incorporated in the *B.P.C.*

VASOLIMENTUM EUCALYPTOLI.—Eucalyptol, 20; Liquid Vasoliment, 80.—*Hager.*

Parogenum Eucalyptolis (Eucalyptol Vasoliment).—Eucalyptol, 20; Parogen, 80.—*B.P.C.*

Eugol is a liquid containing Beta-naphthol, Boric Acid, Menthol, Thymol, Eucalyptol, Gaultheria, and Hamamelis.—*B.M.J.* '98, i. 702; *L.* '98, i. 37.

Eucalypteol (Eucalyptene Bichloride).—A crystalline substance, almost insoluble in Water, melting at 50° C. (122° F.) and boiling at 115° C. (239° F.).

Dose.—5 grains = 0·32 gramme, as an internal antiseptic. 30 grains in Olive Oil may be given as an enema in diarrhœa.

EUCALYPTOL. (Crystallisable).—A definite chemical body ($C_{10}H_{18}O$, eq. 152·98), obtained from Eucalyptus Oil by a freezing process, or by separation as

Eucalyptol Phosphate and subsequent decomposition of this salt by hot Water. It is liquid at ordinary temperatures, but crystallises about 0° C. (32° F.). It should be kept in well-closed glass bottles of a dark amber tint and protected as far as possible from the light. It is identical with an oxidised compound obtained from Oil of Cajuput and a number of other essential oils, consequently the names **Cineol** and **Cajuputol** have also been applied to it.

Dose.—1 to 3 minims = 0·06 to 0·18 c.c.

Official in Fr., Belg., Ital., Port., Span., Swed., Swiss and U.S.

Tests.—Eucalyptol has a specific gravity of 0·928 to 0·930; *U.S.P.* 0·925 at 25° C. (77° F.), *Fr. Codex* (1908) 0·940 at 0° C. (32° F.). It boils at 176° to 177° C. (348·8 to 350·6° F.); *Fr. Codex* 176° C. (348·8° F.). It is optically almost inactive. It is liquid at ordinary temperatures, but crystallises about 0° C. (32° F.). When placed in a freezing mixture and gradually mixed with an equal volume of Phosphoric Acid (1·75 sp. gr.) it sets to a solid white crystalline mass. No diminution in volume should occur when the sample is shaken with an equal volume of Sodium Hydroxide Solution. It dissolves readily in Alcohol (90 p.c.), forming a solution which should be neutral in reaction to Litmus paper, and which should yield no brownish or violet colour on the addition of a drop of Ferric Chloride T.S.

The percentage of Cineol (Eucalyptol) may be determined by the Phosphoric Acid process given under Oil of Eucalyptus.

PHELLANDRENE.—A lævogyrate terpene, occurring in the Oil from *E. amygdalina.* Its presence can readily be detected by the formation of a crystalline nitrosite when the Oil is treated with Nitrous Acid.

OLEUM EUCALYPTI MACULATÆ VAR. CITRIODORA.—A pale yellow oily liquid with a pleasant citronella-like odour. Sp. gr. 0·870 to 0·905. It contains from 84 to 90 p.c. Citronellal, $C_{10}H_{18}O$.

EUDESMOL.—A crystalline Camphor from Eucalyptus Oil.

EUONYMI CORTEX.

EUONYMUS BARK.

Fr., Fusain Noir Pourpré; Ger., Spindlebaum; Ital., Evonimus; Span., Bometero.

The dried Root-bark of *Euonymus atropurpureus* Jacq.

Medicinal Properties.—Tonic, cathartic, and diuretic. The dry extract is a powerful cholagogue and purgative; useful in chronic constipation and torpid liver.

Prescribing Notes.—*Dried* **Extract** *in one form or another has been known for many years as* **Euonymin**; *usually given in the form of* **pills** *with Extract of Henbane; if prescribed alone, a little Soap,* ⅛ *grain in a* 2 *or* 3 *grain pill, and Alcohol* (90 *p.c.*) *q.s. makes a good mass. Also prescribed with Iridin, the dose of which is the same.*

Official Preparation.—Extractum Euonymi Siccum.

Not Official.—Elixir Euonymini Comp., Extract Euonymi, Fluidextractum Euonymini, Liquor Euonymini, Liquor Euonymini et Pepsini, Liquor Euonymin Bismuth Pepsin cum Iridino, Pilula Euonymini et Cascara, Tinctura Euonymi.

Foreign Pharmacopœias.—Official in Fr. and U.S. Not in the others.

Descriptive Notes.—It is probable that a part of the bark of commerce is derived from *E. americanus* L., which has warty fruits and almost sessile, thick leaves. The root-bark usually occurs in small curved or slightly quilled pieces 1½ to 2 inches (37 to 50 mm.)

long and $\frac{1}{12}$ to $\frac{1}{6}$ of an inch (2 to 4 mm.) thick and 12 to 15 mm. in width, of an ashy or brownish-grey colour externally, with scattered patches of soft cork, and occasional small transverse scars and darker lines or patches. The inner surface is pale, of a light brown colour, and the fracture is short and yellowish, with projecting silky threads, more evident when the fractured edges are gently separated. The taste is bitter, somewhat acrid, and mucilaginous. Although only the root-bark is official, both in the *B.P.* and the *U.S.P.*, that of the stem is also sold either separately or mixed with it. It can be distinguished by occurring in longer, thin quills, with a greenish cortical portion, a fibrous bast, and more fibrous fracture.

The bark of *Alstonia scholaris*, R. Br., has been offered for Euonymus, but it is twice as thick, and its transverse fracture does not show cottony threads but small granular masses of stone cells.

Preparation.

EXTRACTUM EUONYMI SICCUM. DRY EXTRACT OF EUONYMUS.

Exhaust Euonymus Bark by percolation with Alcohol (45 p.c.); evaporate the percolate to dryness, and to each 4 of product add 1 of Calcium Phosphate. As it is hygroscopic, it should be kept in stoppered bottles.

Dose.—1 to 2 grains = 0·06 to 0·13 gramme.

Fr., a powder; U.S., an extract.

Not Official.

EXTRACTUM EUONYMI (*U.S.*).—100 of fluid extract is evaporated to dryness, and when powdered mixed with sufficient powdered Liquorice to make 25 by weight.

FLUIDEXTRACTUM EUONYMINI (*U.S.*).—100 of Euonymus in No. 40 powder is exhausted by a mixture of Alcohol (95 p.c.), 80; and Water, 20; reserve the first 80 of percolate, evaporate the remainder to a soft extract, which dissolve in the reserved portion, and make up to 100.

LIQUOR EUONYMINI.—Euonymin, 32 grains; Oil of Coriander, 2 minims; Alcohol (45 p.c.), 1 fl. oz.—*Bournemouth Formulary.*

Dose.—15 to 30 minims = 0·9 to 1·8 c.c.

Dry Extract of Euonymus, 6; Oil of Coriander, 0·75; Alcohol (45 p.c.), *q.s.* to produce 100.—*B.P.C.*

LIQUOR EUONYMIN ET PEPSINI.—Soluble Scale Pepsin, 32 grains; Dilute Hydrochloric Acid, 80 minims; Solution of Euonymin, 4 fl. drm.; Alcohol (45 p.c.), 4 fl. drm.; Chloroform Water, *q.s.* to make 2 fl. oz.—*Bournemouth Formulary.*

LIQUOR EUONYMIN CUM PEPSINO.—Tincture of Euonymus, 2½ fl. oz.; Pepsin, in scales, 240 grains; Diluted Hydrochloric Acid, 3 fl. drm.; Glycerine, 3 fl. oz.; Distilled Water, to 20 fl. oz.—*A.Ph.F.*

This has been incorporated in the *B.P.C.* under the title **Elixir Euonymi et Pepsinæ**, the figures being 12·5, 2·75, 2·0, 15, 100 respectively.

LIQUOR PEPSINI BISMUTHI ET EUONYMI CUM IRIDINO.—Glycerole Pepsin (Armour), 2½ fl. oz.; Ammonio Citrate of Bismuth, 320 grains; Tincture of Euonymus (*B.P.C.*), 400 minims; Iridin, 16 grains; Tincture of Cochineal *q.s.*; Simple Elixir, *q.s.* to make 20 fl. oz.—*Armour's Form.*, also *P.J.F.*

Elixir Euonymi Compositum.—Tincture of Euonymus, 4; Iridin, ⅕; Stronger Glycerine of Pepsine, 12½; Bismuth and Ammonium Citrate, 3½; Solution of Cochineal *q.s.*; Simple Elixir, *q.s.* to produce 100.—*B.P.C.*

PILULÆ EUONYMINI ET CASCARÆ.—Euonymin, 12 grains; Extract of Cascara, 36 grains; Green Extract of Hyoscyamus, 12 grains; Iridin, 12 grains; Extract of Nux Vomica, 1½ grains. Divide in 24 pills.—*Pharm. Form.*

Pilulæ Cascaræ et Euonymini.—Extract of Cascara Sagrada, ½ grain; Euonymin, ¼ grain; Green Extract of Hyoscyamus, ¼ grain for 1 pill.—*B.P.C.*

TINCTURA EUONYMI.—Euonymus Bark, in No. 20 powder, 4; Alcohol (90 p.c.), sufficient to percolate 20.—*B.P.C. Formulary* 1901.

Dose.—10 to 40 minims = 0·6 to 2·4 c.c.
This has been incorporated in the *B.P.C.*

Not Official.

EUPATORIUM.

THOROUGHWORT. BONESET.

The dried leaves and flowering tops of *Eupatorium perfoliatum* L. A perennial plant indigenous to the United States; and is official in *U.S.P.*

Medicinal Properties.—A bitter tonic and diaphoretic. In large doses, emetic and aperient. Has been used in bronchial catarrh, influenza, and muscular rheumatism.

FLUIDEXTRACTUM EUPATORII (*U.S.*).—A 1 in 1 fluid extract of the above prepared by percolation with Alcohol (49 p.c.).

Dose.—20 to 60 minims = 1·2 to 3·6 c.c.

Not Official.

EUPHORBIUM.

The concrete resinous Juice of *Euphorbia resinifera*, Beng. (a native of Morocco), and other species. Official in Austr., Belg., Dan., Fr., Ger., Hung., Ital., Mex., Norw., Port., Span., Swed. and Swiss. It was formerly official in London, Edinburgh and Dublin Pharmacopœias. It contains an acrid Resin. It is a powerful irritant and vesicant, and is used principally in veterinary medicine. It is noticed here because it is official in most of the Foreign Pharmacopœias. A Tincture, 1 in 5, is official in Port.

It must not be confounded with the following:—

EUPHORBIA PILULIFERA.—A plant growing in Queensland and tropical America. The herb is collected when in flower and carefully dried. It yields its virtues to Alcohol and to Ether.

Given in spasmodic asthma and bronchial affections; in coryza and hay fever; and in spasmodic dyspnœa of whatever origin.—*L.* '85, ii. 86; *T.G.* '85, 92; *M.A.* '93, 260; '94, 20; *Y.B.T.* '94, 32.

EXTRACTUM EUPHORBIÆ PILULIFERÆ.—Obtained by the evaporation of the following Tincture.

Dose.—½ to 1 grain = 0·032 to 0·065 gramme.

TINCTURA EUPHORBIÆ PILULIFERÆ.—Euphorbia in No. 20 Powder, 1; Alcohol (60 p.c.), to percolate, 5. *B.P.C. Formulary* 1901, incorporated in the *B.P.C.* under the title **Tinctura Euphorbiæ.**

Dose.—10 to 30 minims = 0·6 to 1·8 c.c., well diluted with Water.

Foreign Pharmacopœias.—Not in any.

Not Official.

EXALGIN.

METHYLACETANILIDE.

$C_6H_5N(CH_3)CH_3CO$, eq. 148·01.

Long, colourless prismatic needles, or in tabular crystals.
It may be prepared by the action of Acetyl Chloride on Monomethylaniline.

Solubility.—1 in 50 of Water, 1 in 2 of Alcohol (90 p.c.), 1 in 4 of Alcohol (60 p.c.), 1 in 2 of Chloroform, 1 in 10 of Ether.

In hot Water Exalgin is very apt to form supersaturated solutions, which when cold will not separate even when stirred or scratched, but set solid at once on the addition of a fragment of a crystal.

Medicinal Properties.—In small doses it acts as an analgesic without producing ill effects, giving the best results in neuralgia and toothache. It is also slightly antipyretic.—*B.M.J.* '90, i. 344, 558; '90, ii. 735; *P.J.* (3) xix. 781, 861; *T.G.* '89, 339, 534, 746, 797; *L.* '89, i. 658; '90, ii. 845; '92, i. 1174, 1175; '93, i. 785. In large doses it possesses toxic properties.

Severe toxic symptoms in an asthmatic woman after taking one dose of 5 grains.—*L.* '95, i. 1307.

Case of poisoning by large dose (150 grains); recovery. Treatment consisted of 30 grains Salicylic Acid by nasal tube, and of hypodermic injection of $\frac{1}{50}$ grain Atropine, followed by two injections of $\frac{1}{100}$ grain.—*L.* '99, ii. 890.

Dose.—½ to 1 grain = 0·032 to 0·065 gramme, was found sufficient by Fraser; but larger doses, 4 to 8 grains = 0·26 to 0·52 gramme, have been given in France.

Prescribing Notes.—*May be given in Mixtures, previously dissolving it in a little Alcohol or Tincture before adding the Water. A nice* **pill** *mass is made by adding Glucose q.s. or ½ grain Compound Tragacanth Powder to each* 3 *grains of Exalgin and Dispensing Syrup q.s. It may also be conveniently given in* **cachets.** *Compressed Tablets are also prepared.*

Foreign Pharmacopœias.—Official in Fr. (Methylacetanilide), Mex. and Span. Not in the others.

Tests.—Exalgin possesses a melting point of 101° C. (213·8° F.) and a boiling point of about 245° C. (473° F.). When boiled with Sodium Hydroxide solution it is decomposed with difficulty, but is completely decomposed by concentrated Hydrochloric Acid with formation of Acetic Acid and Methylaniline. When a small quantity is boiled with Hydrochloric Acid, and the cooled mixture is treated with an excess of Ammonia Solution, no violet coloration should be produced on the addition of Chlorinated Lime Solution. When boiled with a few drops of Chloroform and some Alcoholic Potassium Hydroxide Solution, no odour of Phenyl-isonitrile is evolved. Exalgin dissolves readily in Chloroform, and this fact enables it to be distinguished from Acetanilide and Phenacetin; when 1 gramme of the sample is treated with 2 c.c. of Chloroform, the Exalgin is dissolved. A chloroformic solution of Exalgin remains clear when diluted with 10 times its volume of Petroleum Ether, whereas solutions of Acetanilide and Phenacetin become turbid. 0·5 gramme should leave no weighable residue when heated with free access of air.

MISTURA METHYLACETANILIDI.—Methylacetanilide, 3 grains; Syrup of Orange, 1 fl. drm.; Chloroform Water (*B.P.* '85) to 1 fl. oz.

FEL BOVINUM PURIFICATUM.

PURIFIED OX BILE.

Evaporate 20 fl. oz. of fresh Ox Bile to 5 fl. oz., and mix it with 10 fl. oz. of Alcohol (90 p.c.); separate the precipitate, and reduce the clear fluid to a thick extract.

Solubility.—Soluble in Water and in Alcohol (90 p.c.). Insoluble in Ether.

Medicinal Properties.—Intestinal antiseptic and cholagogue, purgative. Used where there is a deficiency of bile; it assists the emulsification of fats.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

As it is desirable that it should pass into the small intestine unchanged, the pills should be coated with Keratin solution, p. 710, which protects them from the action of the gastric juice.

Foreign Pharmacopœias.—Official in Dutch and Jap. (Fel Tauri Inspissatum); Mex. (Hiel de toro) Port. (Extracto de Fel de Boi), Gall 1, Alcohol 1, Animal Charcoal $\frac{1}{10}$; U.S. (Fel Bovis Purificatum), Ox Gall 3, concentrated to 1, Alcohol 1. Not in the others.

Tests.—Purified Ox Bile is soluble in Water and in Alcohol (90 p.c.), when dissolved in from twenty to thirty times its weight of the former liquid, and mixed with a drop of a fresh syrup prepared by dissolving one part of refined Sugar in four of Water, it yields on the addition of Sulphuric Acid cautiously added so that the precipitate at first formed is redissolved, a cherry-red colour changing through carmine and purple to violet. The reaction is known as Pettenkofer's test, and is the characteristic reaction of Cholalic Acid. It may also be equally well observed by treating a drop of an aqueous solution of the bile on a porcelain surface with a drop of a solution of Cane Sugar, and adding a drop of strong Sulphuric Acid. Owing to a chance of the reaction being obscured by the charring of the Sugar, it has been proposed to employ Furfurol or Glucose in the place of Cane Sugar. Unpurified Ox Bile, if present, is revealed on the addition of Alcohol (90 p.c.) to an aqueous solution, if absent, no precipitate should be produced. The *B.P.* does not state the strength of the aqueous solution to be employed nor the quantity of Alcohol (90 p.c.) to be added; the *U.S.P.* states that an aqueous solution of the purified Ox Gall (presumably 1 in 100) should be clear and should remain transparent upon the addition of an equal volume of Alcohol (94·9 p.c.).

FERRUM.

IRON.

Fe, eq. 55·60.

Fr., Fer; Ger., Gepulvertes Eisen; Ital., Ferro; Span., Hierro.

Annealed Iron wire, having a diameter about 0·005 inch = 0·1 mm. (about No. 35 wire gauge), or wrought iron nails; free from Oxide.

The use of Iron in medicine is of great antiquity; it is said to have been the first mineral used internally, more than 3000 years ago.

Iron salts naturally divide into two groups: the Ferrous or Protosalts, based upon the Oxide FeO; and the Ferric or Sesquisalts (Persalts), based upon the Oxide Fe_2O_3. Ferrous salts have a strong tendency to pass into the Ferric condition by absorption of atmospheric Oxygen, a change which takes place very rapidly in presence of oxidising agents, as Chlorine, Nitric Acid, etc.

Medicinal Properties.—The Iron salts in general are hæmatinic and tonic; the Perchloride and Sulphate are also very astringent and hæmostatic, and are antiseptic. All the Iron salts are stated to be converted into Chloride by the acid of the stomach. The Astringent salts are the most powerful tonics, but as they frequently produce gastric irritation, the Neutral salts are far more generally prescribed. Of these Ferrous Carbonate in its various forms, and the Iron and Ammonium Citrate, are in the greatest demand. The Phosphate preparations are excellent hæmatinics, and are very popular with children. Iron preparations are given after food.

The Iron and Quinine Citrate, Arsenate, and Iodide are given in special cases calling for these combinations.

Iron is useful in most forms of anæmia, and in dyspepsia, debility, chronic cachectic conditions, neuralgia, amenorrhœa and other conditions which so often depend on anæmia; also in convalescence. It is contra-indicated in apoplectic persons and generally in fevers, but has been given with benefit in erysipelas.

When constipation is a symptom, the Iron is combined with some aperient, such as Aloes and Nux Vomica or Cascara; or a mixture containing Magnesium or Sodium Sulphate may be taken separately as required.

Official Preparations.—Of metallic **Iron,** Ferri Sulphas, Liquor Ferri Pernitratis, Liquor Ferri Perchloridi Fortis; of **Iron Wire,** Syrupus Ferri Iodidi, Syrupus Ferri Phosphatis, Syrupus Ferri Phosphatis cum Quinina et Strychnina, Vinum Ferri; of **Ferrous Sulphate,** Ferri Arsenas, Ferri Carbonas Saccharatus, Ferri Phosphas, Ferri Sulphas Exsiccatus, Liquor Ferri Persulphatis, Mistura Ferri Composita; of **Strong Solution of Ferric Chloride,** Liquor Ferri Perchloridi, Tinctura Ferri Perchloridi; of **Solution of Ferric Sulphate,** Ferri et Ammoniæ Citras, Ferri et Quininæ Citras, Ferrum Tartaratum, Liquor Ferri Acetatis; of **Exsiccated Ferrous Sulphate,** Pilula Ferri, Pilula Aloes et Ferri; of **Reduced Iron,** Trochiscus Ferri Redacti; of **Iron and Ammonium Citrate,** Vinum Ferri Citratis.

Not Official.—Mistura Ferri Aromatica, Extractum Ferri Pomati, Iron Malate Wine, Sirupus Ferri Pomati Compositus, Tinctura Ferri Pomati.

Foreign Pharmacopœias.—Official in Austr., Dan., Dutch, Ger., Hung., Ital., Jap., Norw., Swed. and Swiss (Ferrum Pulveratum), Belg. (Ferri Pulvis), Fr. (Fer), Ital. (Limatura de Ferro), also (Ferro Porfirizzato), Port. (Ferro), Mex. (Fierro), Span. (Hierro), and U.S. (Ferrum).

Tests.—Iron when present in solution in the Ferric condition answers the following distinctive tests:—The addition of Ammonia Solution produces a reddish-brown flocculent precipitate, insoluble in excess of the reagent, soluble in Citric or Tartaric Acid; Potassium or Sodium Hydroxide Solution produces a similar precipitate also soluble in Citric or Tartaric Acid; Potassium Ferrocyanide Solution produces a fine blue precipitate insoluble in dilute Hydrochloric Acid, soluble in Oxalic Acid, decomposed by Potassium or Sodium Hydroxide Solution; Potassium Ferricyanide Solution produces a brown or reddish-brown coloration but no precipitate; Ammonium Hydrosulphide Solution produces a black precipitate mixed with Sulphur, on the addition of cold diluted Hydrochloric Acid the black precipitate dissolves, evolving Hydrogen Sulphide gas and leaving a white insoluble precipitate of Sulphur; Ammonium or Potassium

Thiocyanate Solution yields a blood-red coloration readily destroyed by Mercuric Chloride Test-solution, also destroyed by Phosphoric Acid; Tannic Acid Solution produces a black or bluish-black coloration in dilute solutions, a black or bluish-black precipitate in stronger solutions; a solution of the Ferric salt acidified with Hydrochloric Acid liberates Iodine when added to a solution of Potassium Iodide; this reaction has been utilised in the *U.S.P.* as a general method for the determination of Iron in the Ferric condition.

When present in the Ferrous condition its solution yields the following reactions: Ammonia Solution produces a white flocculent precipitate, rapidly turning to a dirty green colour and ultimately to reddish-brown; it is soluble in diluted mineral acid and in Citric or Tartaric Acid, rapidly becoming brown on exposure to air; Potassium or Sodium Hydroxide Solution yields a similar precipitate which behaves similarly with the reagents mentioned; Potassium Ferrocyanide Solution produces a bluish-white precipitate insoluble in dilute Hydrochloric Acid, the precipitate rapidly changes to dark blue on exposure to air; Potassium Ferricyanide Solution produces a dark blue precipitate, insoluble in dilute Hydrochloric Acid and decomposed by Potassium or Sodium Hydroxide Solution; Ammonium Hydrosulphide Solution yields a black precipitate soluble in cold diluted Hydrochloric Acid with the evolution of Hydrogen Sulphide gas, but no precipitate of Sulphur remains; Hydrogen Sulphide Solution yields no precipitate in an acid solution of a Ferrous salt; Ammonium or Potassium Thiocyanate Solution produces no reaction in solutions containing pure Ferrous salt.

Preparation.

VINUM FERRI. Iron Wine.

Iron, in wire, 1; Sherry 20. Set aside for thirty days in a closed vessel, the Iron wire being almost, but not quite, immersed in the Sherry, the vessel being frequently shaken, and the stopper occasionally removed; filter.

The quantity of Iron dissolved seems to depend almost wholly upon the acidity of the Wine. We found that a good dinner Sherry, containing acids equal to 0·396 p.c. of Acetic Acid, dissolved 0·14 p.c. of Iron, and had its acidity reduced to 0·09 p.c. It was treated as directed in the *B.P.*, and the bottle was about half full.

Of such a Vinum Ferri, 3 fl. drm. would represent the Iron contained in 5 minims of Tinctura Ferri Perchloridi.

Commercial samples seem to lie between 0·2 and 0·3 p.c. of Iron, although occasionally samples are found much weaker.

According to *P.J.* (3) xxi. 641, the Iron strength increases for three weeks and then diminishes. Our experience does not agree with this. A gallon quantity was put on and examined after the first week, and afterwards every month for four months, with the following results: 0·084, 0·114, 0·157, 0·185, 0·204 p.c. of metallic Iron.

N.B.—The old Vinum Ferri, made with Malaga, is much sweeter than that of the *B.P.*, and is sometimes ordered on that account.

Dose.—1 to 4 fl. drm. = 3·6 to 14·2 c.c.

Prescribed for young children and delicate females with irritable stomach.

Not Official.

MISTURA FERRI AROMATICA.—Fine Iron Wire, 2; Red Cinchona Bark, in powder, 4; Calumba, in coarse powder, 2; Cloves, bruised, 1; Compound Tincture of Cardamoms, 12; Tincture of Orange Peel, 2; Peppermint Water, 48. Macerate the first four ingredients in the last one for three days in a closed vessel, agitating occasionally, filter, and make up with Peppermint Water to 50; to this add the Tinctures, and preserve in a well-stoppered bottle.—*B.P.* 1885.

Dose.—1 to 2 fl. oz. = 28·4 to 56·8 c.c.

Much valued, especially in Dublin, as a stomachic tonic and hæmatinic.

This has been incorporated in the *B.P.C.*, slightly modifying the quantities in the transposition to the decimal system.

EXTRACTUM FERRI POMATI.—Sour Apples, 50; convert them into a pulp and express; to the expressed liquid add Iron Wire, 1; heat the mixture on a water-bath until the evolution of gas ceases. Dilute the liquid with Water to make 50 parts, and set it aside for several days; then filter and evaporate to a thick extract. The extract should be a greenish-black, and should form a clear solution with Water.

Dose.—3 to 10 grains = 0·20 to 0·65 gramme.

Foreign Pharmacopœias.—Official in Hung. (Ext. Malatis Ferri), Austr., Dan., Norw. and Swed. (Ext. Pomi Ferratum); Belg. and Ger. (Ext. Ferri Pomati); Jap., Russ. and Swiss (Ext. Ferri Pomatum). Swiss is prepared by dissolving freshly precipitated Peroxide of Iron in Apple Juice; all the others are with metallic Iron and Apple Juice.

SIRUPUS FERRI POMATI COMPOSITUS.—Ferrated Extract of Apples, 1; Cinnamon Water, 4; Syrup of Orange Peel, 20; Simple Syrup, 24; Syrup of Rhubarb, 50; Tincture of Cinnamon, 1.—*Swiss.*

TINCTURA FERRI POMATI.—Ferrated Extract of Apples, 1; Alcohol (90 p.c.), 1; Cinnamon Water, to make 10.

Dose.—30 to 90 minims = 1·8 to 5·4 c.c.

Foreign Pharmacopœias.—Official in Austr., Dan., Hung., Norw. and Swed., 1 and 5; Belg., Ger., Jap., Russ. and Swiss, 1 and 9; Dutch (Solutio Ferri Pomata); and Ital. (Tinctura di Malato di Ferro). Not in the others.

IRON MALATE WINE.—In Devonshire a quantity of Iron Wire or Nails is digested in a bottle of Cider for a week; a wineglassful three times a day is the dose.

FERRI ACETATIS LIQUOR.

SOLUTION OF FERRIC ACETATE.

A dark brownish-red liquid possessing an odour of Acetic Acid and an acid astringent taste.

Medicinal Properties.—Has a diuretic in addition to a hæmatinic and astringent action, and being compatible with Potassium Acetate, is used in some cases of Bright's disease.

In the treatment of either broncho or lobar-pneumonia (*B.M.J.* '05, i. 812), the following prescription has yielded surprisingly good results: Liquor Ferri Perchlor., 15 minims; Liquor Ammon. Acet., 2 drm.; Aqua Chloroformi, to ½ oz.; every four hours when taken alone, or every six hours when alternated with the following Strychnine mixture—Liquor Strychninæ, 5 minims; Chloroform Water, to ½ oz.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Not Official.—Tinctura Ferri Acetici Ætherea.

Incompatibles.—The same as given under Tinctura Ferri Perchloridi.

Foreign Pharmacopœias.—Official in Russ. and Swiss, sp. gr. 1·087 to 1·091. Not in the others.

Solubility.—Miscible in all proportions with Water and Alcohol (90 p.c.).

Tests. Solution of Ferric Acetate has a specific gravity of 1·031 to 1·035. It is officially required to answer the tests distinctive of Ferric salts, given under strong Ferric Chloride Solution, but it should be noted that this solution will not react with Potassium Sulphocyanide Solution except in the presence of a free mineral acid (not Phosphoric); neither will it liberate Iodine from Potassium Iodide. Tannic Acid Solution yields a bluish-black coloration or precipitate. Ammonium, Potassium or Sodium Hydroxide Solution produces a reddish-brown precipitate, soluble in Citric or Tartaric Acid Solution. When heated with Sulphuric Acid and a little Alcohol (90 p.c.) the characteristic odour of Ethyl-Acetate is evolved. When warmed with Sulphuric Acid alone it evolves a strong acetous odour.

The more generally occurring impurities are Ammonium, Arsenic, Calcium, Copper, Lead, Sodium, Potassium, Zinc, Nitrates, Sulphates, and Ferrous salts. Arsenic may be detected by the modified Gutzeit's test, Copper, Lead and Zinc by Hydrogen Sulphide in either acid or alkaline solution, Ammonium by the evolution of an odour of Ammonia when the liquor is warmed with Potassium or Sodium Hydroxide Solution, Calcium by the precipitate or cloudiness produced by Ammonium Oxalate Solution; Nitrates and Sulphates after the removal of the Iron, the former by the Ferrous Sulphate ring test, the latter by Barium Chloride Solution.

Not Official.

TINCTURA FERRI ACETICI ÆTHEREA (*Swiss*).—Solution of Iron Acetate (sp. gr. 1·087 to 1·091), 8; Alcohol, 1; Acetic Ether, 1. All by weight.

Dose.—10 to 20 minims = 0·6 to 1·2 c.c.

Official in Russ., the proportions being 9, 2, and 1 respectively.

Not Official.

FERRI ALBUMINAS.

A liquor is official in the Dutch Pharmacopœia containing 0·25 p.c. of Ferric Oxide, and several other formulas have been proposed, but it is more convenient to use the commercial scale preparation, which is fairly soluble in Water, and contains 5 p.c. of Ferric Oxide.

Medicinal Properties.—Hæmatinic tonic. Given with success in anæmia, and specially recommended in gastric ulcer.—*T.G.* '86, 399; *L.* '94, ii. 1113; '95, i. 1065; *B.M.J.E.* '94, i. 28, 96; *Pr.* liii. 87.

Dose.—3 to 10 grains = 0·2 to 0·65 gramme.

Foreign Pharmacopœias.—Official in Dan., Dutch, Ger., Jap., Russ. and Swiss (Liquor Ferri Albuminati); Swed. (Liquor Oxydi Ferrici Albuminati). All containing 0·4 p.c. of Iron.

LIQUOR FERRI ALBUMINATI.—Dry Egg Albumen, 4; Solution of Ferric Oxychloride, 13; Alcohol (95 p.c.), 12; Aromatic Elixir (*U.S.P.*), 40;

Solution of Sodium Hydroxide (*U.S.P.*) and Distilled Water, *q.s.* of each to produce 100.—*U.S.N.F.*

This has been incorporated in the *B.P.C.*, employing 12·5 of Alcohol (90 p.c.) in place of 12 of Alcohol (95 p.c.).

FERRATIN.—A brown, tasteless powder, containing 7 p.c. of Iron, prepared from egg Albumen and Tartarated Iron in alkaline solution. Daily dose for children, 5 to 15 grains, and for adults, 20 to 30 grains.—*Pr.* li. 427; *A.J.P.* '94, 500; *B.M.J.* '95, i. 985; *B.M.J.E.* '95, ii. 16; '96, i. 8; *T.G.* '96, 40; *L.* '96, ii. 1820; *B.M.J.E.* '02, ii. 11.

Official in Russ.

Alboferin (Iron Albuminate).—An almost odourless, brown powder, soluble in Water.—*B.M.J.E.* '02, i. 68.

Carniferrin.—A compound of Iron with Phospho-carnic Acid. A brown powder containing about 30 p.c. of Iron.

Fersan (Iron Paranucleo-proteid).—An Iron compound, obtained from red blood corpuscles, soluble in Water.—*B.M.J.E.* '00, ii. 20.

Dose.—10 to 30 grains = 0·65 to 2 grammes.

Ferri Alginas (Alginoid Iron).—A tasteless, brown powder, containing about 10 p.c. of Iron. Insoluble in Water, soluble in Ammonia. Recommended in anæmia.—*P.J.* '98, ii. 199; *B.M.J.* '02, i. 723.

Claimed (*M.P.* '05, ii. 9) that this drug has two advantages over other compounds of Iron: (1) it does not derange digestion; (2) it does not cause constipation. Alginic Acid is a nitrogenous acid obtained from seaweed. It is best given in powder or cachets.

Dose.—2 to 15 grains = 0·13 to 1 gramme.

Particularly useful in chlorosis with vomiting and pain in the stomach.

FERRI PEPTONAS.—A brown or reddish-brown powder, having a meaty and somewhat disagreeable odour. Readily soluble in Water.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

LIQUOR FERRI PEPTONATI.—Peptone, dry, 4; Solution of Ferric Oxychloride, 20; Alcohol, 12; Aromatic Elixir (*U.S.P.*), 40; Solution of Sodium Hydroxide (*U.S.P.*) *q.s.*; Distilled Water, *q.s.* to produce 100.—*U.S.N.F.*

This has been incorporated in the *B.P.C.*

LIQUOR FERRI PEPTONATI CUM MANGANO.—Ferric Peptonate, 4·5; Soluble Manganese Citrate, 0·8; Ammonia Water (*U.S.P.*), 1·3; Aromatic Elixir, 5·0; Alcohol (95 p.c.), 15·00; Distilled Water, *q.s.* to produce 100.—*U.S.N.F.*

Manganese Chloride, 0·35; Solution of Iron Peptonate, *q.s.* to produce 100.—*B.P.C.*

FERRI ARSENAS.

IRON ARSENATE.

ARSENIATE OF IRON.—*B.P.* '85.

FR., ARSÉNIATE DE FER; GER., ARSENSAURES EISENOXYDUL;
SPAN., ARSENIATO DE HIERRO.

A tasteless, olive-green, amorphous powder, consisting of Ferrous Arsenate, $\mathbf{Fe_3(AsO_4)_2, 6H_2O}$, eq. 550·12, Ferric Arsenate and some Iron Oxide, and containing not less than 12½ p.c. of hydrous, equivalent to 10 p.c. of anhydrous Ferrous Arsenate.

Medicinal Properties.—Similar to those of Arsenious Acid; the quantity of Iron in the dose is extremely small.

Dose.—$\frac{1}{16}$ to $\frac{1}{4}$ grain = 0·004 to 0·016 gramme.

Prescribing Note.—*Best given in* pill *well triturated with Milk Sugar, and massed with a little Glucose.*

Antidotes.—*See* Acidum Arseniosum.

Not Official.—Mistura Ferri Arsenicalis, Pilula Ferri Arsenicalis, Ferri Arsenio-Citras Ammoniata, Injectio Ferri Arsenatis Solubilis.

Foreign Pharmacopœias.—Official in Fr., Mex. (Arseniato de Fierro) and Span. Not in the others.

Tests.—Iron Arsenate dissolves in Hydrochloric Acid, and the solution answers the tests distinctive of both Ferrous and Ferric salts given under Ferrum. After separation of the Iron, the neutralised filtrate should yield a reddish-brown precipitate with Silver Ammonio-nitrate Solution, and a white crystalline precipitate with Magnesium Ammonio-sulphate. It is officially required to indicate 10 p.c. of anhydrous or nearly 12½ p.c. of hydrous Ferrous Arsenate as determined by titration with Volumetric Potassium Bichromate Solution, using Potassium Ferricyanide Solution as an indicator, 1 gramme requiring at least 6·7 c.c. The solution in Hydrochloric Acid should yield no decided turbidity with Barium Chloride Solution, indicating the absence of more than a trace of Sulphates.

Not Official.

MISTURA FERRI ARSENICALIS.—Arsenical Solution, 2 minims; Iron and Ammonium Citrate, 5 grains; Tincture of Calumba, 10 minims; Water, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

Citrate of Iron and Ammonium, 8 grains; Arsenical Solution, 5 minims; Tincture of Calumba, 30 minims; Water, to 1 fl. oz.—*University.*

Arsenical Solution, 5 minims; Iron and Ammonium Citrate, 6 grains; Infusion of Quassia, to 1 fl. oz.—*Guy's.*

PILULA FERRI ARSENICALIS.—Arsenious Anhydride, $\frac{1}{60}$ grain; Exsiccated Ferrous Sulphate, 3 grains; Excipient, *q.s.* for one pill.—*University.*

Arsenious Acid, $\frac{1}{50}$ grain; Exsiccated Ferrous Sulphate, 3 grains; Milk Sugar and Syrup of Glucose, *q.s.* for one pill.—*B.P.C.*

FERRI ARSENIO-CITRAS AMMONIATA.—Green or yellowish-green deliquescent scales, containing 1·4 p.c. Arsenious Acid and 15 to 18 p.c. of Iron. Readily soluble in Water. A valuable antiperiodic. Best administered by subcutaneous injection.

INJECTIO FERRI ARSENATIS.—A neutral, sterilised solution, containing 2·5 p.c. of the above salt, specially prepared for hypodermic administration. The dose, which is 1 c.c., contains 0·00035 gramme Arsenious Acid and from 0·00375 to 0·0045 gramme of Iron.

FERRI CACODYLAS.—*See* under SODII CACODYLAS.

Not Official.

FERRI BROMIDUM.

The commercial salt is in greyish-white crystalline masses, coated with red insoluble Oxybromide, which amounts to about 0·5 p.c.

It generally contains about 18 p.c. of Water, corresponding nearly with the formula $FeBr_2,3H_2O$, eq. 347·29. When this is not allowed for, a Syrup or Liquor made from the solid Bromide, and calculated as if anhydrous, will be proportionately weaker than when made from Iron Wire.

Foreign Pharmacopœias.—Not in any.

LIQUOR FERRI BROMIDI FORTIS.—A clear green liquid. Sp. gr. 1·554.

Each fl. drm. contains 36 grains of Iron Bromide ($\mathbf{FeBr_2}$, eq. 214·3).

This solution keeps well in a corked bottle, with bright Iron Wire immersed in it, and on filtration gives a clear green liquid.

With the addition of a small quantity of Hypophosphorous Acid, the Liquor will keep very well.

Foreign Pharmacopœias.—Official in Mex. (Bromuro Ferroso) and Port. (Brometo Ferroso), both solid, no solution. Not in the others.

SYRUPUS FERRI BROMIDI.—Strong Solution of Iron Bromide (filtered), 1; Simple Syrup, 7; mix.

Contains 4½ grains of Iron Bromide in each fl. drm.

Medicinal Properties.—A tonic in anæmia and amenorrhœa.

Syrupus Ferri Bromidi.—Iron Wire free from oxide, 2·5; Bromine, 6; Refined Sugar, 70; Distilled Water, *q.s.* to yield 100.—*B.P.C.*

It is not stated in the *B.P.C.* whether the Bromine is by weight or measure, but as it is taken from the *Conference* formula, it is most probably by weight, and rather less Bromine is used in the *B.P.C.* It was subsequently stated to be by weight.

Each fl. drm. contains about 4½ grains of Ferrous Bromide.

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

SYRUPUS FERRI BROMIDI CUM QUININA.—Acid Quinine Hydrobromide, ¼ oz.; Diluted Hydrobromic Acid, 2 fl. drm.; Distilled Water, 1 fl. oz.; dissolve the Quinine salt in the Acid and Water mixed; then add Syrup of Ferrous Bromide, *q.s.* to yield 12½ fl. oz.—*B.P.C.*

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

1 fl. drm. contains about $1\frac{1}{10}$ grains of Acid Quinine Hydrobromide, and about 4 grains Ferrous Bromide.

It is rather stronger in Quinine than the *Conference* formula.

SYRUPUS FERRI BROMIDI CUM STRYCHNINA.—Strychnine 1 grain; Diluted Hydrobromic Acid, 70 minims; Syrup Ferrous Bromide, to 8 fl. oz.

60 minims contains $\frac{1}{64}$ grain of Strychnine.

SYRUPUS FERRI BROMIDI CUM QUININA ET STRYCHNINA.—Dissolve 1 grain of Strychnine, in powder, in 8 fl. oz. of the Syrup of Ferrous Bromide with Quinine given above.—*B.P.C.*

1 fl. drm. contains about $\frac{1}{64}$ grain Strychnine, about $1\frac{1}{10}$ grains Quinine Acid Hydrobromide and about 4 grains Ferrous Bromide.

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

FERRI CARBONAS SACCHARATUS.

SACCHARATED IRON CARBONATE.

FR., SACCHARURE DE CARBONATE FERREUX; GER., ZUCKERHALTIGES FERRO CARBONAT.

Dull, greyish-brown, amorphous, odourless powder, having at first a sweet and subsequently a ferruginous taste. It is officially stated to consist of Ferrous Oxycarbonate, $x\mathbf{FeCO_3},y\ \mathbf{Fe(OH)_2}$, in a greater or less degree of oxidation, mixed with Sugar; the Ferrous salt, if reckoned as Ferrous Carbonate, $\mathbf{FeCO_3}$, eq. 115·15, constituting about 33⅓ p.c. of the mixture.

A new method of preparing Saccharated Carbonate of Iron is recommended by Mr. J. H. Franklin; he proposes the use of liquid Glucose instead of Sugar; the percentage of ferrous carbonate obtained is about double that obtained by the official process, and keeps perfectly in a well-closed bottle. It is useful in the preparation of pills, tablets and capsules.—*P.J.* '07, ii. 114, 155.

Medicinal Properties.—An excellent chalybeate; readily taken and well borne. Not astringent. Useful in anæmia, and in anæmic forms of amenorrhœa, neuralgia and sciatica. Ferrous Carbonate, in the form of 'Blaud's Pills,' is a very popular medicine.

Dose.—10 to 30 grains = 0·65 to 2 grammes.

The above dose is equivalent to 3⅓ to 10 grains = 0·216 to 0·65 gramme of Ferrous Carbonate.

Prescribing Notes.—*Given in* **cachets, lozenges,** *or* **pills.** *Sometimes ordered in the form of Powders to be taken on bread and butter. A good pill can be made by adding Dispensing Syrup q.s. It can also be taken as an* **effervescent granule.**

Incompatibles.—Acids and Acidulous salts; all Vegetable astringents.

Official Preparations.—Mistura Ferri Composita and Pilula Ferri. Although not actually prepared from the Saccharated Iron Carbonate, they are here grouped for comparison.

Not Official.—Massa Ferri Carbonatis, Pilulæ Ferri Carbonatis, Trochisci Ferri Carbonatis Saccharati, Ferri Oxidum Saccharatum.

Foreign Pharmacopœias.—Official in Austr. and Swiss (Ferrum Carbonicum Saccharatum), contains about 20 p.c. of Carbonate; Belg. (Carbonas Ferri Saccharatus), 20 p.c.; U.S. contains 15 p.c.; Ger., Jap. and Russ., 9·5 to 10 p.c. of Iron equal to about 20 p.c. of Carbonate; Norw. (Hydratocarbonas Ferrosus Saccharatus). No Sugar: Jap. (Ferrum Subcarbonicum); and Mex. (Carbonato de Fierro). Not in the others.

Tests.—Saccharated Iron Carbonate dissolves with effervescence in diluted Hydrochloric Acid, and the solution yields with Potassium Ferrocyanide or Potassium Ferricyanide Solution a blue precipitate. It is officially required to contain about 33⅓ p.c. of the Ferrous Salt if reckoned as Ferrous Carbonate; the *U.S.P.* preparation is required to contain not less than 15 p.c. of Ferrous Carbonate, and the *P.G.* from 9·5 to 10 p.c. of Iron, corresponding to 19·7 to 20·7 p.c. of Ferrous Carbonate. The *B.P.* employs Volumetric Potassium Bichromate Solution for the determination, and Potassium Ferricyanide Solution as an indicator, dissolving the Carbonate in warm concentrated Phosphoric Acid, notwithstanding it having been shown that warming on a water-bath even for 10 minutes introduced an error of 25 p.c. The *U.S.P.* dissolves the Carbonate in Diluted Sulphuric Acid and performs the titration with Tenth-normal Volumetric Potassium Dichromate Solution. The *P.G.* converts the whole of Ferrous salt into the Ferric condition, and determines the total Ferric Iron with Potassium Iodide Solution, titrating the liberated Iodine with Tenth-normal Volumetric Sodium Thiosulphate Solution.

A 2 p.c. solution of the Carbonate in sufficient Hydrochloric Acid to effect solution and ensure a slight excess of acid should yield no pronounced turbidity with Barium Chloride Test Solution.

Barium Nitrate (or Chloride).—A solution of Saccharated Iron Carbonate prepared as above should not give more than a slight cloudiness with T S. of Barium Chloride, *U.S.P.* The *P.G.* requires that a solution of the Saccharated Iron Carbonate in Water (1–50) obtained by means of the least possible quantity of Hydrochloric should only be rendered slightly turbid by T.S. of Barium Nitrate, *P.G.*

Volumetric Determination.—The solution of 1 gramme of Saccharated Iron Carbonate in excess of warm concentrated Phosphoric Acid diluted with Water should require at least 29 c.c. of the Volumetric of Potassium Bichromate Solution, using Potassium Ferricyanide Solution as an indicator, *B.P.*; the solution obtained by dissolving 1·15 gramme in 10 c.c. of dilute Sulphuric Acid, diluted to about 100 c.c. with Water should require not less than 15 c.c. of Tenth-normal Volumetric Solution of Potassium Dichromate for complete oxidation, using Potassium Ferricyanide Solution as an indicator, *U.S.P.*; the *P.G.* directs that 1 gramme be dissolved in 10 c.c. of dilute Sulphuric Acid without heat. To this is added solution of Potassium Permanganate (5–1000) until the faint transitory reddening just becomes permanent, then 2 grammes Potassium Iodide. The mixture is allowed to stand for one hour in a closed vessel at ordinary temperatures, and then titrated with Tenth-normal Volumetric Solution of Sodium Thiosulphate; for combination with the free Iodine 17 to 17·8 c.c. of Tenth-normal Volumetric Solution of Sodium Thiosulphate should be necessary.

Preparations.

MISTURA FERRI COMPOSITA. COMPOUND MIXTURE OF IRON. *N.O.Syn.*—GRIFFITH'S MIXTURE.

Reduce 60 grains of Myrrh to powder, and mix it with 30 grains of Potassium Carbonate and 60 grains of Refined Sugar; form this into a smooth thin paste, by rubbing with a small quantity of Rose Water. Gradually add more Rose Water and 50 minims of Spirit of Nutmeg until the product measures 7 fl. oz. Dissolve 25 grains of Ferrous Sulphate in 3 fl. oz. of Rose Water, and mix with the above.

It is convenient to keep the first part of the mixture ready made, and to add the Ferrous Sulphate solution when required for use.

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.

The following modification has been suggested by Mr. J. H. **Franklin**:—Saccharated Carbonate of Iron (with Glucose), 16 grains; Syrup of Glucose, 3 fl. drm.; Gum Acacia (in powder), 20 grains; Tincture of Myrrh, 4 fl. drm.; Spirit of Nutmeg, 50 minims; Rose Water to produce 10 fl. oz. Reduce the Saccharated Carbonate of Iron to a fine powder, triturate with the Syrup of Glucose and continue the trituration with a few drops of Rose Water to form a smooth thin paste, gradually add more of the Rose Water, and add the Acacia diffused in the Tincture of Myrrh and Spirit of Nutmeg, finally making the product measure 10 fl. oz. with Rose Water.—*P.J.* '07, ii. 155; *C.D.* '07, ii. 180.

This has been incorporated in the *B.P.C.* under the title **Mistura Ferri Carbonatis Composita.**

Foreign Pharmacopœias.—Official in Dan., similar to Brit., but with three times as much Sugar, and without Nutmeg; Norw., without Nutmeg, with Peppermint Water; Swed., Emulsio Myrrhæ Ferrata, with Peppermint Water and Tincture of Lavender in the place of Rose Water and Nutmeg; U.S. similar to Brit., but with Spirit of Lavender in the place of Nutmeg. Not in the others.

PILULA FERRI. IRON PILL.

Mix 150 grains of Syrup, 10 grains of Glycerin and 20 grains of Distilled Water; with this incorporate 150 grains of Exsiccated Ferrous Sulphate; add 95 grains of Exsiccated Sodium Carbonate, and mix quickly. Allow 15 minutes for the salts to react, and make into a pill mass by the addition of 50 grains of powdered Gum Acacia and 15 grains of powdered Tragacanth.

If divided into 5-grain pills, each pill will contain about 1 grain of Ferrous Carbonate.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Pilula Ferri Carbonatis (*B.P.* '85).—Made with Saccharated Iron Carbonate, 4; Confection of Roses, 1; contains rather more Ferrous Carbonate than Pilula Ferri (*B.P.* '98).

The following modification has been suggested by Mr. J. H. Franklin:—Saccharated Carbonate of Iron (with Glucose), 648 grains; Liquorice Root (in powder), 162 grains; Liquid Glucose, 216 grains; Water, 54 grains. Make a mass, and divide into pills weighing 2½, 5 and 7½ grains each.—*P.J.* '07, ii. 115.

This has been incorporated in the *B.P.C.*

Vallet's mass is made by precipitating and washing the Iron Carbonate, and mixing it with Honey and Milk Sugar to form a mass. *See* below.

Blaud's Pills are made by mixing (in the pill mass) dried Ferrous Sulphate and dried Potassium or Sodium Carbonate. *See* below.

Foreign Pharmacopœias.—Official in Belg. and Dutch (Pilulæ Blaud), Dan. and Norw. (Pilulæ Blaudii) also (Pilulæ Ferri Compositæ), Fr. (Pilules de Carbonate Ferreux, formule de Vallet, and Pilules de Carbonate de Fer composées, Pilule de Blaud, Ger. and Jap. (Pilulæ Ferri Carbonici Blaudii), Austr. (Pilulæ Ferri Carbonici), Ital. (Pillole di Carbonato Ferroso) (Pillole di Blaud) also (Pillole di Vallet), Mex. (Pildoras de Blaud and Pildoras de Vallet), Port. (Pilulas de Carbonato Ferroso), Span. (Pildoras de Blaud), Swed. (Pilulæ Ferratæ Blaudii and Pilulæ Myrrhæ Ferratæ), Swiss (Pilulæ Ferratæ Blaudii and Pilulæ Ferri Carbonici) (Pil. Valleti); U.S. (Pilulæ Ferri Carbonatis) (Blaud's Pills), also (Massa Ferri Carbonatis) (Vallet's Mass). Not in the others.

Not Official.

MASSA FERRI CARBONATIS (Vallet's Mass).—Dissolve 100 of Ferrous Sulphate and 46 of Monohydrated Sodium Carbonate, each separately, in 200 of boiling Distilled Water, and, having added 20 of Syrup to the solution of the Iron salt, filter both solutions and allow them to become cold; gradually add the Iron solution to the Sodium solution in a 500 bottle, rotating it until Carbonic Acid gas no longer escapes. Add Distilled Water, *q.s.* to fill the bottle; then cork it and set aside so that the Ferrous Carbonate may subside. Pour off the supernatant liquid, and wash the precipitate with a mixture of Syrup 1, Water 19, by decantation until the washings no longer have a saline taste. Drain and press; mix the precipitate at once with 38 of Clarified Honey and 25 of Sugar, and evaporate the mixture in a tared dish on a water-bath, with constant stirring, until it is reduced to 100.—*U.S.*

PILULÆ FERRI CARBONATIS (Blaud's Pills).—Rub 8 grammes of Potassium Carbonate in a mortar with about 10 drops each of Glycerin and Water, then add 16 grammes of Ferrous Sulphate and 4 grammes of Sugar, previously triturated together to a uniform powder, and rub the mass thoroughly until it assumes a greenish colour. When the reaction has terminated incorporate 1 gramme of Tragacanth and 1 gramme of Althæa, and, if necessary, a little more Water, so as to obtain a mass of pilular consistence. Divide this into 100 pills.—*U.S.*

TROCHISCI FERRI CARBONATIS SACCHARATI.—Containing 3 grains of Saccharated Carbonate in each.

Dose.—1 to 3 lozenges.

FERRUM OXIDUM SACCHARATUM (*Ger.* and *Austr.*).—A reddish-brown powder, with a sweet, slightly ferruginous taste; a mixture of Hydrated Ferric Oxide and Sugar, containing the equivalent of 2·8 p.c. of Iron.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

FERRI ET AMMONII CITRAS.

IRON AND AMMONIUM CITRATE.

Thin, translucent, deep ruby-red, odourless, deliquescent scales, possessing a ferruginous and somewhat astringent taste.

Solubility.—10 in 5 of Water, and measures 10¼; 2 dissolved in 3 of Water measure 4; almost insoluble in Alcohol (90 p.c.).

Medicinal Properties.—As a hæmatinic, it is a very effectual salt, and it possesses scarcely any astringency or tendency to cause gastric irritation or constipation; it may often be given when the stomach will not bear the more astringent preparations of Iron. It becomes moist if kept in paper.

A useful prescription for combating the anæmia which is often a marked feature of neurasthenia is Ferric Ammonium Citrate, 7 grains; Liquor Arsenicalis, 5 minims; Potassium Bromide, 10 grains; Liquor Ammon. Acet., 1 drm.; Chloroform Water, to 1 oz.—*B.M.J.* '06, i. 494.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Prescribing Note.—*Generally prescribed in solution with Tincture of Orange, which covers the taste well.*

An **Aqueous Solution,** 2 fl. oz. representing 480 grains of the scale preparation, is convenient for dispensing, and keeps well.

Incompatibles.—Mineral Acids, Vegetable astringents, and fixed Alkalis.

Official Preparation.—Vinum Ferri Citratis.

Not Official.—Mistura Ferri cum Ammonia.

Foreign Pharmacopœias.—Official in U.S., Jap. and Swiss (Ferrum Citricum Ammoniatum), Belg. (Ferrum Citricum), Fr. (Citrate de Fer Ammoniacal), Ital. (Citrato di Ferro Ammoniacale), Mex. (Citrato de Fierro Amoniacal), Norw. (Citras Ferrico-Ammonicus), Port. (Citrato de Ferro Ammoniacal), Swed. (Citras Ferricus), Swiss (Ferrum Citricum Ammoniatum), Span. (Citrato Ferrico-Amonico). Not in the others. Ger. has Ferrum Citricum Oxydatum.

Tests.—Iron and Ammonium Citrate has a faintly acid reaction towards blue Litmus paper. When incinerated with free access of air it leaves a residue of 31 or 32 p.c. of Ferric Oxide. An aqueous solution when heated with an excess of Potassium Hydroxide Solution evolves the distinctive odour of Ammonia, and yields a brownish-red precipitate, and if this precipitate be filtered off, the filtrate, when neutralised with Acetic Acid, yields on boiling with a little Calcium Chloride Solution a white precipitate.

Over and above the statement that when incinerated with free access of air it leaves 31 or 32 p.c. of Ferric Oxide, the *B.P.* gives no method for the determination of the Iron. The *U.S.P.* employs the Potassium Iodide process mentioned below, titrating the liberated Iodine with Tenth-normal Volumetric Sodium Thiosulphate Solution, using Starch Solution as an indicator. As thus determined, the percentage of metallic Iron should amount to not less than 16 p.c., equivalent to not less than 22·8 p.c. of Ferric Oxide.

The more generally occurring impurities are fixed alkalis, Tartrates and Sulphates. Fixed Alkalis may be detected by the reaction of the ash towards Litmus paper; it should not show an alkaline reaction towards red Litmus paper. Tartrates are indicated by the appearance of a crystalline precipitate on the addition of an excess of Acetic Acid to the filtrate after removal of the Iron by boiling with Potassium Hydroxide Solution. An aqueous solution should yield no pronounced turbidity with Barium Chloride Solution.

Volumetric Determination.—The *U.S.P.* directs that 0·555 gramme of the salt be dissolved in 15 c.c. of Water and 2 c.c. of Hydrochloric Acid in a glass stoppered flask having a capacity of about 100 c.c., and 1 gramme of Potassium Iodide added. The flask is then securely closed and the mixture kept at a temperature of 40° C. (104° F.) for half an hour and then cooled. When titrated with Tenth-normal Volumetric Solution of Sodium Thiosulphate, using Starch T.S. as indicator, the mixture should require not less than 16 c.c. of the Volumetric Solution to discharge the colour of the liquid.

Preparation.

VINUM FERRI CITRATIS.—WINE OF IRON CITRATE.

Iron and Ammonium Citrate, 160 grains; Orange Wine, *q.s.* to yield 20 fl. oz. (1 grain in each fl. drm.)

Dose.—1 to 4 fl. drm. = 3·6 to 14·2 c.c.

Official in Jap. (Vinum Ferri), 1 in 50; Mex. (Vino de Fierro), 1 in 150; Span. (Vino Calibeado), 1 and 200 of Malaga.

Vinum Ferri (*U.S.*).—Iron and Ammonium Citrate, 4; Tincture of Sweet Orange Peel, 6; Syrup, 10; White Wine, *q.s.* to produce 100.

Vinum Ferri Amarum, *see* p. 517.

Not Official.

MISTURA FERRI CUM AMMONIA.—Iron and Ammonium Citrate, 10 grains; Aromatic Spirit of Ammonia, 30 minims; Infusion of Quassia, to 1 fl. oz.—*King's.*

Iron and Ammonium Citrate, 5 grains; Aromatic Spirit of Ammonia, 10 minims; Spirit of Chloroform, 5 minims; Infusion of Quassia, to 1 fl. oz.—*Royal Free.*

FERRI ET QUININÆ CITRAS.

IRON AND QUININE CITRATE.

Thin, transparent, pale yellowish-green, deliquescent scales possessing a bitter and ferruginous taste.

It should be kept in well-closed vessels and protected as far as possible from the light.

Solubility.—2 in 1 of Water.

Medicinal Properties.—Bitter stomachic and tonic, combining the properties of both Iron and Quinine.

6⅔ grains contain 1 grain of Quinine.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Prescribing Notes.—*Generally given in Mixture with Tincture of Orange and Spirit of Chloroform, or Syrup of Orange; or in Pills made with Alcohol (90 p.c.) q.s. It is sometimes prescribed with Potassium Citrate or Lithium Citrate, both of which have a tendency to throw out Quinine Citrate. It can be given in the form of Effervescent Granules, dose one teaspoonful.*

For dispensing purposes, it is convenient to keep an aqueous **solution,** 2 *fl. oz.* = 480 *grains of the salt.*

Incompatibles.—Alkalis, their Carbonates and Citrates, Lithium Citrate, Tannic Acid, and vegetable astringents.

Not Official.—Vinum Ferri Amarum, Vinum Ferri et Quininæ, Ferri Quininæ et Strychninæ Citras, Ferri et Strychninæ Citras.

Foreign Pharmacopœias.—Official in Austr. (Ferrum Citricum Chiniatum); Ger., Jap. and Russ. (Chininum Ferro-Citricum); Dan. (Citras Ferricus cum Chinina); Norw. (Citras Ferricus cum Chinino); Port. (Citrato de Ferro e de Quinina); Swed. (Citras Ferrico-Chinicus); Swiss (Chinino-Ferrum Citricum); U.S. Not in the others. U.S. has also Ferri et Quininæ Citras Solubilis.

Tests.—Iron and Quinine Citrate dissolves readily in Water, yielding a solution which is very faintly acid in reaction towards blue Litmus paper. The aqueous solution yields with Potassium Hydroxide Solution a reddish-brown precipitate, and when heated evolves Ammonia (which fact is not noticed in *B.P.*); with Ammonia Solution it yields a white curdy precipitate, with Potassium Ferrocyanide and with Potassium Ferricyanide blue precipitates, with Tannic Acid a bluish-black precipitate.

It is officially required to contain 15 p.c. of Ether-soluble alkaloid, which when neutralised by Sulphuric Acid should answer to the tests for Quinine Sulphate. No standard for the percentage of Iron is given. The *U.S.P.* requires the salt to contain not less than 11·5 p.c. of dried Quinine, and Ferric Citrate corresponding in amount to not less than 13·5 p.c. of metallic Iron. The *P.G.* preparation contains from 9 to 10 p.c. of Quinine, and is required to leave not less than 30 p.c. of Iron Oxide on ignition. An outline of the method adopted by the *B.P.* for the determination of the Quinine is given below. The extracted alkaloid is required to be almost entirely soluble in a little purified Ether, to leave but a minute residue on ignition, and, when neutralised by Sulphuric Acid, to answer the tests distinctive of Quinine Sulphate. The *U.S.P.* employs Chloroform as a solvent for the Quinine, and requires that the dried residue should conform to the reactions and tests for Quinine. The Iodometric method is adopted for the determination of the Iron, the determination being conducted on the liquid remaining after the removal of the Quinine. The *P.G.* employs Ether as a solvent in the Quinine determination. Allen has pointed out that in shaking out with Chloroform or Ether a considerable excess of Ammonia should be present, and the volume of the solvent should equal that of the ammoniacal liquid. The alkaloidal residue should be dried at 110° to 120° C. (230° to 248° F.), a constant weight being difficult to obtain at a water-bath temperature.

The more generally occurring impurities are fixed alkalis, which may be detected by the alkaline reaction of the residue left on ignition, and Tartrates, which yield a crystalline precipitate, when Acetic Acid is added in slight excess to the filtrate after removal of the Iron by precipitation with boiling Potassium Hydroxide Solution.

Gravimetric Determination.—Dissolve a weighed quantity of 5 grammes of the salt in 45 c.c. of Water, add Ammonia Solution in slight excess, extract the liberated alkaloid by repeated shakings with Ether. Separate the ethereal solutions, mix, evaporate to dryness, and when completely dried at 120° C. (248° F.), cool and weigh. The residue should amount to 0·75 gramme, *B.P.*; a weighed quantity of 1·11 gramme of the salt is dissolved in 20 c.c. of Water, transferred to a separator, rendered alkaline with 5 c.c. of Ammonia Solution, and the mixture shaken out for 1 minute with 10 c.c. of Chloroform. The chloroformic layer is separated and the agitation twice repeated with successive quantities each of 10 c.c. of Chloroform. The Chloroform solutions are mixed, transferred to a tared dish, the Chloroform evaporated spontaneously, the residue dried at 100° C. (212° F.) till constant in weight. It should weigh not less than 0·1276 gramme, which is equivalent to at least 11·5 p.c. of Quinine. The aqueous liquid from the above determination is freed from Chloroform by heating on a water-bath until all ammoniacal and chloroformic odours have disappeared, cooled, and diluted with Water to 50 c.c. A measured quantity of 25 c.c. is transferred to a glass stoppered flask capable of holding about 100 c.c., 3 c.c. of Hydrochloric Acid and 1 gramme of Potassium Iodide added, the flask securely stoppered, and the mixture allowed to stand half an hour at 40° C. (104° F.). When cool not more than 13·5 c.c. of Tenth-normal Volumetric Sodium Thiosulphate shall be required to discharge the colour of the liquid, Starch Solution being employed as an indicator. 1 c.c. of Tenth-normal Volumetric Sodium Thiosulphate Solution indicating 1 p.c. of metallic Iron, *U.S.P.*; a weighed quantity of 1 gramme of the salt is dissolved in 4 c.c. of Water, and sufficient Sodium Hydroxide Solution (15 p.c.) added to ensure a strongly alkaline reaction. The mixture is then shaken out three times in succession with 7 c.c. of Ether. The separated ethereal layers are mixed, evaporated to dryness, and the residue dried at 100° C. (212° F.). It should weigh at least 0·09 gramme, *P.G.*

Not Official.

VINUM FERRI AMARUM.—Soluble Iron and Quinine Citrate, 5; Tincture of Sweet Orange Peel, 6; Syrup, 30; White Wine, *q.s.* to produce 100.—*U.S.P.*

VINUM FERRI ET QUININÆ.—Iron and Quinine Citrate, 2; Detannated Sherry, *q.s.* to produce 100.—*B.P.C.*

Ferri, Quininæ et Strychninæ Citras, resembling the above but containing in addition 1 p.c. of Strychnine, and **Ferri et Strychninæ Citras** (*U.S.*), similar to the above but without Quinine, are both scale preparations, the doses of which are 2 to 5 grains = 0·13 to 0·32 gramme.

Not Official.

FERRI HYPOPHOSPHIS.

There are two Iron Hypophosphites, the Ferrous and the Ferric. The latter is used in most of the American and other proprietary Syrups of the Hypophosphites. The Ferric salt has now replaced the Ferrous salt in the *B.P.C.* preparations.

FERROUS HYPOPHOSPHITE, when freshly prepared, is a greenish crystalline powder, soluble about 1 in 10 of Water, but the commercial salts are so insoluble as to be practically useless for pharmaceutical purposes.

FERRIC HYPOPHOSPHITE.—This compound is obtained as a white precipitate on adding a solution of a soluble Hypophosphite to one of Ferric Chloride containing as little free acid as possible.

It is fairly insoluble in Water, but with the addition of Potassium Citrate it dissolves readily to a green solution, which forms with Sugar a pale yellow *neutral* Syrup, permanent and unalterable by exposure to air, which may be combined with other soluble Hypophosphites, Quinine Hydrochloride, and Strychnine without the addition of acid, and is free from all the pharmaceutical objections attaching to Hypophosphite Syrups containing Iron in the ferrous condition.

Official in U.S.

It is usually sold as **Compound Syrup of Hypophosphites**, and is also made without Quinine to suit those who are peculiarly susceptible to that drug; it is then prescribed 'sine Quinina.'

LIQUOR FERRI HYPOPHOSPHITIS FORTIS.—Solution of Ferric Sulphate, 14·2; Solution of Ammonia, 23; Citric Acid, 7·6; Sodium Hypophosphite, 9·6; Sodium Citrate, 6·6; Distilled Water *q.s.* and Chloroform Water (1 in 200) *q.s.* to produce 100.—*B.P.C.*

This formula was devised (*Y.B.P.* '07, 265) as an improvement on the old *B.P.C.* method.

The solution of Ferric Sulphate is diluted with an equal volume of Water and added to the solution of Ammonia also diluted with an equal volume of Water. After the precipitated Ferric Hydroxide has subsided sufficiently, wash it by decantation with Distilled Water until free from Sulphates, collect the precipitate and drain it; dissolve it in the Citric Acid previously dissolved in 20 of Distilled Water by the aid of a water-bath. When the solution is clear add the Sodium Hypophosphite and continue the heat until a clear greenish solution is produced; add the Sodium Citrate, filter and pass sufficient Chloroform Water through the filter to make up 100 of product.

The *B.P.C. Supplement* replaces the 14·2 of solution of Ferric Sulphate by 12·9 of Ferric Citrate.

LIQUOR HYPOPHOSPHITUM.—Calcium Hypophosphite, 3·5; Sodium Hypophosphite, 2; Potassium Hypophosphite, 1·75; Citric Acid, 1·6; Water, *q.s.* to produce 100; dissolve and filter.—*U.S.N.F.* 1896.

This has been incorporated in the *B.P.C.*

In *U.S.N.F.* 1906 the 1·6 of Citric Acid is replaced by 0·6 of Hypophosphorous Acid, *U.S.P.*

Dose.—10 to 30 minims = 0·6 to 1·8 c.c.

LIQUOR HYPOPHOSPHITUM COMPOSITUS. *Syn.* Liquor Ferri Hypophosphitis Compositus.—Dissolve 320 grains of Calcium Hypophosphite, 320 grains of Sodium Hypophosphite, and 160 grains of Magnesium Hypophosphite in 12 fl. oz. of Distilled Water, add 6 fl. oz. of Strong Solution of Ferric Hypophosphite; filter, and add Distilled Water to make the product 20 fl. oz.—*B.P.C. Formulary* 1901.

Each fl. drm. = 2 grains each of Sodium and Calcium Hypophosphites, 1 grain Magnesium Hypophosphite, and 1½ grains of Ferric Hypophosphite.

Dose.—½ to 2 fl. drm. = 1·8 to 7·1 c.c.

This has been incorporated in the *B.P.C.* as follows:—Calcium Hypophosphite, 3·5; Magnesium Hypophosphite, 1·75; Sodium Hypophosphite, 3·5; Strong Solution of Ferric Hypophosphite, 30; Distilled Water, sufficient to produce 100.

SYRUPUS FERRI HYPOPHOSPHITIS.—Strong Solution of Ferric Hypophosphite, 1; Syrup, 4.—*B.P.C. Formulary* 1901, incorporated in the *B.P.C.*

Each fl. drm. = about 1 grain of Ferric Hypophosphite.

Dose.—½ to 2 fl. drm. = 1·8 to 7·1 c.c.

SYRUPUS HYPOPHOSPHITUM.—Calcium Hypophosphite, 4·5; Potassium Hypophosphite, 1·5; Sodium Hypophosphite, 1·5; Diluted Hypophosphorous Acid, 0·20; Tincture of Fresh Lemon Peel, 0·5; Sugar, 65; Water, *q.s.* to make 100.—*U.S.P.*

Dissolve the Hypophosphites in 45 of the Water, add the Tincture and the Acid; filter, and in the filtrate dissolve the Sugar without heat; make up to 100 with Water.

This has been incorporated in the *B.P.C.*

SYRUPUS HYPOPHOSPHITUM COMPOSITUS.—Calcium Hypophosphite, 80 grains; Manganese Hypophosphite, 40 grains; Potassium Hypophosphite, 40 grains; Quinine Hypophosphite, 20 grains; dissolve in 8 fl. oz. of Chloroform Water; add 1 grain of Strychnine dissolved in 1 fl. drm. of Hypophosphorous Acid; and then 1 fl. oz. of Strong Solution of Ferric Hypophosphite; add 14 oz. of Refined Sugar and dissolve without heat; add sufficient Chloroform Water to make 20 fl. oz. and strain through flannel.—*B.P.C.*

Each fl. drm. contains $\frac{1}{160}$ grain Strychnine, and $\frac{1}{8}$ grain of Quinine Hypophosphite.

Dose.—$\frac{1}{2}$ to 2 fl. drm. = 1·8 to 7·1 c.c.

The employment of Potassium Citrate (1·033 gramme) in the place of Ammonium Citrate for dissolving the precipitated Ferric Hypophosphite, as originally recommended in the *Companion*, is also advocated.—*P.J.* '02, ii. 532.

Syrupus Hypophosphitum Compositus.—Rub 2·25 of Ferric Hypophosphite and 2·25 of Manganese Hypophosphite with 3·75 of Sodium Citrate, add 30 c.c. of Water and warm the mixture for a few minutes, until a clear greenish solution is obtained. Dissolve 35 of Calcium Hypophosphite, 17·5 of Potassium Hypophosphite in a mixture of 450 c.c. of Water, and 5 c.c. of Diluted Hypophosphorous Acid; then dissolve 1·10 of Quinine and 0·115 of Strychnine in a mixture of 30 c.c. of Water and 10 c.c. of Diluted Hypophosphorous Acid; mix the solutions and finally dissolve in them 775 of sugar. Strain the Syrup, if necessary, and add Water *q.s.*, through the strainer, to produce 1000 c.c.—*U.S.*

Not Official.

FERRI IODIDUM.

IRON IODIDE.

FeI_2, eq. 307·40.

In reddish-brown, deliquescent dense masses, easily soluble in Water, leaving only a slight residue, and forming a reddish-yellow solution owing to partial oxidation. The solution may be made green by either hot or cold digestion over bright Iron Wire.

Medicinal Properties.—It combines the properties both of Iodine and Iron, and is a most valuable tonic and alterative in the treatment of scrofulous and syphilitic diseases.

Prescribing Notes.—*Best given in the form of the official Syrup of Ferrous Iodide; it is also given in the form of pills massed with powdered Gum Acacia and Dispensing Syrup, q.s. In some cases Liquorice Powder must be used instead of Dispensing Syrup.*

Official Preparation.—Syrupus Ferri Iodidi.

Foreign Pharmacopœias.—Official in Mex. (Yoduro Ferroso) and Port. Not in the others. Jap. has Ferrum Iodati Saccharatum.

LIQUOR FERRI IODIDI FORTIS.—A clear, greenish liquid.

Each fl. drm. contains 44 grains of Ferrous Iodide (FeI_2 = 307·40). It can be diluted 1 to 7 with Syrup to prepare a Syrup of Iron Iodide, or with Water to make Liquor Ferri Iodidi the same strength as the Syrup.

With the addition of a small quantity of Hypophosphorous Acid, the solution will keep well for a long time; but in this case, when diluting with Syrup, it must be remembered that the official Syrup does not contain Hypophosphorous Acid.

The *B.P.C.* gives a formula for the strong Liquor containing 7·5 p.c. of Diluted Hypophosphorous Acid (*U.S.P.*).

Foreign Pharmacopœias.—Official in Belg., Ger. (Liquor Ferri Iodati), Russ. and Swiss (Ferrum Iodatum Solutum); all contain 50 p.c. of Ferrous Iodide; Mex. (Solucion oficinal de Yoduro ferroso) 20 p.c.

Incompatibles.—Acids, Acid salts, Alkalis and their Carbonates, Lime Water, vegetable astringents.

PILULÆ FERRI IODIDI (*U.S.*).—Reduced Iron, 4 grammes; Iodine, 5 grammes; Glycyrrhiza, in No. 60 powder, 4 grammes; Sugar, in fine powder, 4 grammes; Extract of Glycyrrhiza, in fine powder, 1 gramme; Acacia, in fine powder, 1 gramme; Water, a sufficient quantity. To the Reduced Iron, contained in a small mortar, add 6 c.c. of Water, and then gradually the Iodine, constantly triturating, until the mixture ceases to have a reddish tint. Then add the remaining powders, previously well mixed together, and mix the whole thoroughly. Transfer the mass to a porcelain capsule, and evaporate the excess of moisture, on a water-bath, with constant stirring, until the mass has acquired a pilular consistence. Coat with Balsam of Tolu dissolved in Ether. To make 100 pills.

Pilula Ferri Iodidi was official in *B.P.* '85, but omitted in 1898: it has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in Belg., Dan., Dutch, Fr., Ital., Mex., Norw., Port., Span., Swed. and Swiss, each pill contains about ¾ grain Iodide of Iron: Hung., about 1 grain; and all coated with Balsam of Tolu dissolved in Ether, except Dutch, which uses Tolu in Chloroform, and Swiss, not coated. Not in the others.

Official Preparation.

SYRUPUS FERRI IODIDI. Syrup of Ferrous Iodide.

Iron Wire, ½ oz.; Iodine, 726 grains; Refined Sugar, 16½ oz.; Distilled Water, *q.s.* to produce 20 fl. oz. of a pale green Syrup containing 3 grains of Ferrous Iodide in 33 minims.

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

This Syrup is very liable to become discoloured. It may be due to one or other of two causes: (1) Oxidation of Iron, which may be prevented by careful manipulation, or removed by Hypophosphorous Acid. (2) Slight caramelisation of the Sugar by overheating; this cannot be removed by reducing agents.

Foreign Pharmacopœias.—Official in Brit., 9·83 to 10 p.c. of Iron Iodide; Austr., Belg., Dan., Dutch, Ger., Jap., Russ., Span., Swiss and U.S., 5 p.c.; Fr. and Port., 0·5 p.c.; Hung., 12·2 p.c.; Ital., 0·6 p.c.; Mex., 1 p.c.; Norw. and Swed., 10 p.c. All by weight.

The *Brussels Conference* agreed to a strength of 5 p.c. anhydrous Ferrous Iodide.

Tests.—Syrup of Ferrous Iodide has a specific gravity of 1·380 to 1·387; the *U.S.P.* syrup a specific gravity of about 1·349 at 25° C. (77° F.). When diluted with Water it affords with Potassium Ferricyanide Solution a dark blue precipitate. The diluted syrup mixed with Starch Solution yields on the addition of a little Chlorine Water a deep blue coloration. It is officially required to contain not less than 9·83 p.c. w/v, equivalent to 7·1 p.c. w/w, nor more than 10·14 p.c. w/v, equivalent to 7·31 p.c. w/w, of anhydrous Ferrous Iodide, as determined by decomposition of the Ferrous Iodide with Sodium Carbonate and titration of the exactly neutralised solution of Sodium Iodide with Volumetric Silver Nitrate Solution, using Potassium Chromate Solution as an indicator. The *U.S.P.* syrup is required to contain about 5 p.c. w/w, equivalent to 6·74 p.c. w/v of Ferrous Iodide. The Ferrous Iodide is estimated by indirect titration with Tenth-normal Volumetric Silver Nitrate Solution, the excess of Silver being titrated with Tenth-normal Volumetric Potassium Sulphocyanate Solution, Ferric Ammonium Sulphate Solution being used as an indicator. The standard of 5 p.c. w/w of anhydrous Ferrous Iodide is that suggested by the Brussels Conference for the unification of the pharmacopœial formulas for potent drugs. Several processes claiming to be improvements on the official method of determination have been suggested, but do not appear to have been adopted.

The *B.P.C.* in an explanatory footnote to the preparation stated that it contained 1 p.c. of Ferrous Iodide. This was obviously incorrect, and has since been rectified.

Volumetric Determination.—A measured quantity of 10 c.c. (equivalent to 13·87 grammes) of the Syrup is introduced into a flask of 100 c.c. capacity containing 1 gramme of dried Sodium Carbonate dissolved in 10 c.c. of Water. The mixture is shaken until complete interaction has taken place; sufficient Water is added to bring the volume of the liquid to 100 c.c., the whole mixed and filtered. A measured quantity of 25 c.c. of the filtrate is exactly neutralised with diluted Nitric Acid and titrated with Volumetric Silver Nitrate Solution, using Potassium Chromate Solution as an indicator; not less than 16·0 nor more than 16·5 c.c. should be required, *B.P.*; a weighed quantity of 10 grammes should be diluted with Water to 100 c.c. and 15·4 c.c. of the solution be mixed with 15 c.c. of Water, 6 c.c. of Tenth-normal Volumetric Silver Nitrate Solution and 2 c.c. each of diluted Nitric Acid and Ferric Ammonium Sulphate Solution are added and the mixture thoroughly shaken. On titration with Tenth-normal Potassium Sulphocyanate Solution not more than 1 c.c. should be required to produce a permanent reddish-brown tint; 1 c.c. of Tenth-normal Volumetric Silver Nitrate Solution corresponds to 1 p.c. of Ferrous Iodide, *U.S.P.*

FERRI LACTAS.

See under ACIDUM LACTICUM.

Not Official.

FERRI PERCHLORIDUM.

FERRIC CHLORIDE.

N.O.Syn.—Chloretum Ferricum.

The commercial solid, or crystalline, Ferric Perchloride approximates to the formula $Fe_2Cl_6.12H_2O$, eq. 536·90; it occurs in yellow, or yellowish-brown, crystalline masses, deliquescing in air. It is soluble in Water, Alcohol (90 p.c.), Ether and Glycerin.

Medicinal Properties.—A powerful local styptic. 3 grains to an oz. of Water for a **spray**; 60 to 120 grains to an oz. of Water or Diluted Glycerin (Glycerin 1 and Water 1) for a **paint.**

2½ oz. dissolved in 1 oz. of Water makes a solution about the same strength as Liquor Ferri Perchlor. Fort.

For **Incompatibles,** *see* Tinctura Ferri Perchloridi.

The Anhydrous Ferric Chloride (Fe_2Cl_6, eq. 322·34), prepared by sublimation, is in black metallic-looking plates. It deliquesces rapidly on exposure to the air, and then solidifies again to a Hydrate ($Fe_2Cl_6.12H_2O$), containing almost 40 p.c. of Water. Another Hydrate ($Fe_2Cl_6.5H_2O$), containing 21·7 p.c. of Water (official in the Portuguese Pharmacopœia), can be obtained by evaporating an acid solution until syrupy, and then cooling it.

Foreign Pharmacopœias.—Official in Austr. and Hung. (Ferrum Sesquichloratum Crystallisatum); Dan., Dutch, Norw. and Swed. (Chloretum Ferricum); Mex. (Cloruro Ferrico); Port. (Chloreto Ferrico Anhydro), also Crystallisado; Ger., Jap. and Russ. (Ferrum Sesquichloratum); Span. (Chloruro Ferrico) (Anhydrous and the Hydrate); Swiss (Ferrum Sesquichloratum); U.S. (Ferri Chloridum).

FERRI PERCHLORIDI LIQUOR FORTIS.

STRONG SOLUTION OF FERRIC CHLORIDE.

A dark reddish-brown liquid, possessing a powerfully styptic taste; readily miscible with Water, and Alcohol (90 p.c.).

Medicinal Properties.—A powerful local styptic and astringent; escharotic. The more dilute forms are used internally to arrest hæmorrhage in the gastro-intestinal or urinary tracts. *See* also 'Tinctura Ferri Perchloridi,' p. 524.

The liquor (not fortis) in ½ drm. doses thrice daily for hæmorrhagic gastric oozing.—*L.* '06, ii. 1189.

Official Preparations.—Liquor Ferri Perchloridi and Tinctura Ferri Perchloridi.

Not Official.—Glycerinum Ferri Perchloridi, Liquor Ferri Chloroxydi, Liquor Ferri Dialysatus, Liquor Ferri Oxychlorati, Mistura Ferri Amara, Mistura Ferri Aromatica, Mistura Chalybeata, Mistura Ferri cum Magnesii Sulphate, Mistura Ferri Salina, Syrupus Ferri Subchloridi, Tinctura Ferri Chlorati Ætherea, Tinctura Ferri Sesquichloridi, and Tinctura Ferri Muriatis.

Foreign Pharmacopœias.—Official in Austr., sp. gr. 1·280 to 1·290 (10 p.c. of Iron); Belg., sp. gr. 1·28 (29 p.c. Iron Chloride); Dan. and Swed., sp. gr. 1·298 to 1·302 (10 p.c. of Iron); Dutch, sp. gr. 1·470 to 1·482 (75 p.c. of Iron Chloride); Fr., Port. and Span., sp. gr. 1·260 (about 9 p.c. of Iron); Jap. and Norw., sp. gr. 1·280 to 1·282 (10 p.c. of iron); Mex., sp. gr. 1·260 (26 p.c. of anhydrous Iron Chloride); Swiss, sp. gr. 1·280 to 1·290 (about 10 p.c. of Iron); Ger., Hung. and Russ. sp. gr. 1·280 to 1·282 (10 p.c. of Iron); Ital., sp. gr. 1·28 to 1·29 (10 p.c. of Iron, 29 p.c. Iron Chloride); U.S., sp. gr. 1·315 at 25° C. (77° F.) (10 p.c. of Iron, 29 p.c. Iron Chloride).

Tests.—Strong Solution of Ferric Chloride has, according to the *B.P.*, a specific gravity of about 1·42, but there is a discrepancy between the Pharmacopœia figure for Oxide and this figure. The *U.S.P.* Liquor has a specific gravity of 1·280 to 1·290 at 25° C. (77° F.); the *P.G.* Liquor 1·280 to 1·282. The diluted solution answers the tests distinctive of Ferric salts given under Ferrum. Silver Nitrate Solution produces in the diluted solution, acidified with Nitric Acid, a white curdy precipitate, insoluble in Nitric Acid, but readily soluble in Ammonia Solution. It is officially required to indicate 32·0 p.c. w/v of Iron Oxide, which is equivalent to 39·8 p.c. of anhydrous Ferric Chloride. The *U.S.P.* preparation is required to contain not less than 29 p.c. of anhydrous Ferric Chloride, corresponding to 10 p.c. of metallic Iron. The method of determination adopted by the *B.P.* is a gravimetric one. The Iron is precipitated as Hydroxide, ignited and weighed as Oxide; the precipitate obtained by adding an excess of Ammonia Solution to a measured quantity of 5 c.c. diluted with 80 c.c. of Water, when well washed and ignited should leave a residue weighing 1·6 grammes. The *U.S.P.* process is volumetric, and is described below. The amount of Oxide yielded by the *B.P.* process has been shown (*C.D.* '99, ii. 220; '00, ii. 163; *Y.B.P.*, '99, 361; *P.J.*, '99, ii. 44, 63, 133; '00, ii. 106) to be at variance with the specific gravity. A sample made strictly in accordance with the *B.P.* gave 1·604 grammes of Iron Oxide per 5 c.c., but possessed a specific gravity of 1·488 instead of 1·42.

The more generally occurring impurities are Ammonium, Arsenic, Calcium, Copper, Lead, Potassium, Sodium and Zinc; Nitrates and Ferrous salts. Of these the more important are Arsenic, Copper, Lead and Zinc. Arsenic may be detected by Bettendorf's test with Stannous Chloride Solution; Copper and Zinc by Hydrogen Sulphide, using the filtrate after removal of the Iron by Ammonia Solution, or by Potassium Ferrocyanide Solution after removal of the Iron with excess of Ammonia Solution; Lead by precipitation as Sulphate.

Nitrates are examined for by the Ferrous Sulphate test, and Ferrous salts with Potassium Ferricyanide Solution.

A test for Oxychloride with Tenth-normal Volumetric Sodium Thiosulphate Solution is given in the *P.G.* and *U.S.P.* Each of these tests is given in small type below.

Zinc Iodide Starch Solution.—Strips of paper soaked with Zinc Iodide Starch Solution should not be coloured blue when brought near to Liquor Ferri Sesquichlorati, *P.G.*

Potassium Ferrocyanide.—Diluted Solution of Ferric Chloride yields a dark blue precipitate with T.S. of Potassium Ferrocyanide, *P.G.* and *U.S.P.* If 5 c.c. of Ferric Chloride Solution diluted with 20 c.c. of Water be mixed with excess of T.S. of Ammonia and the mixture filtered a colourless filtrate should be obtained, which when supersaturated with Acetic Acid should not be affected by T.S. of Potassium Ferrocyanide, *P.G.*

Potassium Ferricyanide.—Solution of Ferric Chloride diluted with 10 parts of Water and acidulated with Hydrochloric Acid should not produce a blue coloration with T.S. of Potassium Ferricyanide, *P.G.* The *U.S.P.* directs that a few drops of freshly-prepared T.S. of Potassium Ferricyanide be added to a diluted portion of Solution of Ferric Chloride (1–20), a pure brown colour should be produced which should not turn green or greenish-blue at once.—*U.S.P.*

Sodium Thiosulphate.—Three drops of Ferric Chloride Solution heated slowly to boiling with 10 c.c. of Tenth-normal Volumetric Solution of Sodium Thiosulphate should not give a precipitate of Ferric Hydroxide, *U.S.P.* and *P.G.*

Residue.—If to Ferric Chloride Solution (5 c.c. diluted with 20 c.c. of Water, *P.G.*) there be added excess of T.S. of Ammonia, and the mixture filtered, a colourless filtrate should be obtained which should not yield a weighable residue on evaporation and gentle ignition, *U.S.P.* and *P.G.*

Hydrogen Sulphide.—A portion of the filtrate obtained as described in the Residue test above should not yield a precipitate with T.S. of Hydrogen Sulphide, *U.S.P.*

Barium Nitrate.—Another portion of this filtrate should not be affected by T.S. of Barium Nitrate, *P.G.*

Ferrous Sulphate.—A third portion of 2 c.c. of this filtrate, mixed with 2 c.c. of Sulphuric Acid and 1 c.c. of T.S. of Ferrous Sulphate carefully poured over this as a layer, should not give a brown ring, *P.G.* The *U.S.P.* directs that a clear crystal of Ferrous Sulphate be added to a cooled mixture of equal volumes of Sulphuric Acid and a diluted portion of Solution of Ferric Chloride Solution (1-10); the crystal should not become coloured brown, nor should a brownish-black colour develop around it.

Stannous Chloride.—A mixture of 1 c.c. of Ferric Chloride Solution and 3 c.c. of T.S. of Stannous Chloride should not assume a dark colour in the course of an hour, *P.G.*

Volumetric Determination.—The *U.S.P.* gives the following instructions: 10 grammes of the Solution are diluted to measure 100 c.c. and 11·1 c.c. of this mixture are introduced into a glass stoppered bottle of 100 c.c. capacity, together with 10 c.c. of Water and 2 c.c. of Hydrochloric Acid. 1 gramme of

Potassium Iodide is then added and the mixture kept at a temperature of 40° C. (104° F.) for half an hour, then cooled and mixed with a few drops of T.S. of Starch. The mixture when titrated with Tenth-normal Volumetric Solution of Sodium Thiosulphate should require not less than 20 c.c. of the Volumetric Solution to discharge the blue or greenish colour; 1 c.c. of the V.S. is equivalent to 0·5 p.c. of metallic Iron.

Preparations.

LIQUOR FERRI PERCHLORIDI. Solution of Ferric Chloride.

Dilute 1 of Strong Solution of Ferric Chloride with Distilled Water to make 4 of a liquid, sp. gr. 1·110. (1 in 4)

Dose.—5 to 15 minims = 0·32 to 1·0 gramme.

This solution and the 'Tincture of Ferric Chloride' contain identical proportions of Ferric Chloride; for 'Prescribing Notes' *see* below.

TINCTURA FERRI PERCHLORIDI.—Tincture of Ferric Chloride. *N.O.Syn.*—Steel Drops. Tincture of Steel.

Mix 1 of Strong Solution of Ferric Chloride with 1 of Alcohol (90 p.c.), and add Distilled Water to make 4. (1 in 4)

Medicinal Properties.—Astringent, tonic, hæmostatic. Given in passive hæmorrhage and to arrest hæmorrhage in typhoid. As a general tonic during convalescence; highly useful in anæmia; valuable in large doses for faucal and for erysipelatous inflammations. A rectal injection of 60 minims of the Tincture in half a pint of Water kills thread-worms.

Recommended (*L.* '04, ii. 1178, 1248, 1415), not only in puerperal septicæmia, but also in local and general septic infection occurring in gynæcological practice. 15 to 25 minims every two hours strongly recommended in blood poisoning. —*L.* '04, ii. 1313.

If Potassium Iodide be added to an aqueous solution of Potassium Citrate, and Tincture of Ferric Chloride added, a yellowish-green solution is obtained, containing no free Iodine, and remaining permanent for months at least. This is suggested (*C.D.* '05, ii. 971; *P.J.* '05, ii. 861) as a means of overcoming the incompatibility of Potassium Iodide and Ferric Chloride solutions.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Prescribing Notes.—*Preparations of Iron can be given in Infusion of Quassia, or Calumba, but they tinge Infusion of Chiretta and Hops, and change to brown or black those of Cusparia, Gentian, Orange, Cascarilla, Cinchona, Cloves, Digitalis, and all astringent infusions.*

Glycerin is better than an equal quantity of Syrup for masking the unpleasant astringent taste of Ferric Chloride Solutions. Chloroform Water is also useful.

Equal volumes of Liquor Ferri Perchloridi and Glycerin forms a good paint in faucal inflammation.

Styptic Wool, containing Ferric Chloride, is useful for local application.

Incompatibles.—Alkalis and their Carbonates, Lime Water, Calcium Carbonate, Magnesia and its Carbonate, Salicylates, Mucilage of Acacia.

Foreign Pharmacopœias.—Official in Dan., Norw. and Swed. (Solutio Chloreti Ferrici Spirituosa); Dan. and Swed., also (Solutio Chloreti Ferrici Spirituoso-Ætherea); Ger. and Russ. (Tinct. Ferri Chlorati Ætherea); U.S. (Tinctura Ferri Chloridi); Port., from the salt, with Alcohol and Ether; Ital. (Soluzione Alcoolico-Eterea di Cloruro Ferrico), from the Solution with Alcohol and Ether; Swiss (Spiritus Ætherеus Ferratus). Not in the others. *See* also 'Tinctura Ferri Chlorati Ætherea.'

Tests.—Tincture of Ferric Chloride has a specific gravity of 1·085 to 1·089; contains about 12 p.c. w/v of total solids and about 22 p.c. w/v of Absolute Alcohol. It yields with Ammonia Solution a reddish brown voluminous precipitate; with Potassium Ferrocyanide Solution a blue precipitate, and with Silver Nitrate Solution a white curdy precipitate, insoluble in Nitric Acid. The *U.S.P.* Tincture has a specific gravity of about 1·005 at 25° C. (77° F.), and contains not less than 13·28 p.c. of anhydrous Ferric Chloride, corresponding to 4·6 p.c. of metallic Iron.

Tinctura Ferri Sesquichloridi P.L.—Tinctura Ferri Muriatis P.E.—There is an idea, which periodically finds its way into print, that a Tincture made according to the formula of the London and Edinburgh Pharmacopœias is more efficacious than the *B.P.*, and can be given in cases where the other is not tolerated. From a chemical point of view the only difference is that *P.L.* is three-fourths the strength of *B.P.*, and when freshly made contains one-fifteenth of the Iron in the Ferrous condition. Alcohol has no reducing action on Ferric Chloride, even after years of contact.

Liquor Ferri Chloroxydi and **Liquor Ferri Dialysatus** have been much used as palatable, non-astringent, and non-irritant hæmatinics, given in cases where the astringent salts would derange the stomach.

Not Official.

LIQUOR FERRI CHLOROXYDI.—A solution in Water of a basic Ferric Chloride, containing 0·8 p.c. of Chlorine for 5 p.c. of Ferric Oxide, approximating to the formula $Fe_2Cl_6 7Fe_2O_3$. This is the ratio of the Solution made by us many years previous to the use of 'Dialysed Iron.' It was and is still made to contain 7·1 p.c. of Ferric Oxide to correspond with the official Tincture.

Dose.—10 to 30 minims = 0·6 to 1·2 c.c

LIQUOR FERRI DIALYSATUS (Dialysed Iron).—This was formerly official in *B.P.*, but is now omitted. It contains 5 p.c. of Ferric Oxide, and was dialysed until nearly tasteless. It is better to work to a definite percentage of Chlorine; it may be reduced to 0·3 p.c. without interfering with the stability of the solution. It is very doubtful, however, whether there is any advantage in reducing the Chlorine ratio below that of Liquor Ferri Chloroxydi as described above.

Another method is to add a certain proportion of diluted Ammonia Solution to a solution of Ferric Chloride, so that the precipitate which first forms just redissolves. The Ammonia becomes Ammonium Chloride and the Iron a very basic Oxychloride, from which the Ammonium salt is readily dialysed. Where a saving of expense is an object, as in some large institutions, it would probably be equally efficacious without dialysis.

Dose.—10 to 30 minims = 0·6 to 1·8 c.c.

Foreign Pharmacopœias.—Official in Austr. (Ferrum Hydrooxydatum Dialysatum Liquidum); Ger., Hung., Russ. and Swed., when Liquor Ferri Oxidati Dialysati is prescribed, Liquor Ferri Oxychlorati (sp. gr. 1·050) may be dispensed; Belg. and Swiss (Ferrum Oxychloratum Solution), sp. gr. 1·05; Mex. (Oxido de Fierro Dialisado), sp. gr. 1·046. Not in the others.

Liquor Ferri Oxychlorati.—Dilute Ferric Chloride Solution 35, with 160 of Distilled Water, and pour into a mixture of Ammonia Water 35 and Distilled Water 320; wash, press, and dissolve the precipitate in 3 of Hydrochloric Acid, finally warming it to about 40° C. and dilute the solution with Distilled Water until it has a sp. gr. 1·05.—*Ger.* *Jap.* has the same formula, but employs 2·5 of Hydrochloric acid (30 p.c.), in place of the *P.G.* (25 p.c.).

Liquor Ferri Oxychloridi.—Solution of Ferric Chloride (*U.S.P.*), 35, by weight; Ammonia Water (*U.S.P.*), 35, by weight; Hydrochloric Acid (*U.S.P.*), 2·35, by weight; Water, *q.s.* to produce 100 by weight.—*U.S.N.F.*

Strong Solution of Ferric Chloride (*B.P.*), by weight, 22·50; Solution of Ammonia (*B.P.*), by weight, 35·00; Hydrochloric Acid (*B.P.*), by weight, 2·35; Distilled Water, *q.s.* to produce by weight 100.—*B.P.C.*

Both of the above are stated to correspond in strength with **Liquor Ferri Oxychlorati.**—*P.G.*

GLYCERINUM FERRI PERCHLORIDI.—Solution of Ferric Chloride, 1 fl. oz.; Glycerin, 1 fl. oz.—*Middlesex* and *University.*

Ferric Chloride, 1; Glycerin, 4.—*Guy's.*

MISTURA FERRI AROMATICA.—Solution of Ferric Chloride, 10 minims; Aromatic Spirit of Ammonia, 20 minims; Syrup, 40 minims; Water, to 1 fl. oz.—*St. Thomas's.*

Dose.—1 fl. oz. Mix with the Syrup the Iron Solution, and add the Aromatic Spirit previously diluted with the Water.

This has been incorporated in the *B.P.C.* under the title **Mistura Ferri Ammoniata.**

MISTURA CHALYBEATA.—Solution of Ferric Chloride, 15 minims; Syrup, 30 minims; Infusion of Quassia, to 1 fl. oz.—*St. Thomas's.*

Dose.—1 fl. oz.

This has been incorporated in the *B.P.C.* under the title **Mistura Ferri Amara** with the *syn.* Mistura Chalybeata.

Mistura Ferri Amara.—Solution of Perchloride of Iron, 20 minims; Spirit of Chloroform, 5 minims; Infusion of Quassia, to 1 fl. oz.—*Lock.*

MISTURA FERRI CUM MAGNESII SULPHATE.—Solution of Ferric Chloride, 15 minims; Magnesium Sulphate, 20 grains; Glycerin, 40 minims; Infusion of Quassia, to 1 fl. oz.—*St. Thomas's.*

Dose.—1 fl. oz.

This has been incorporated in the *B.P.C.*

MISTURA FERRI SALINA.—Potassium Citrate, 22 grains; Solution of Ferric Chloride, 24 minims; Chloroform Water, to 1 fl. oz.—*University.*

Dose.—½ to 1 fl. oz.

SYRUPUS FERRI SUBCHLORIDI.—Iron Wire, 300 grains; Hydrochloric Acid, 2 fl. oz.; Citric Acid, 10 grains; Distilled Water, 10 fl. drm.; Syrup, *q.s.* to produce 20 fl. oz.—*B.P.* '85.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

This has been incorporated in the *B.P.C.*

TINCTURA FERRI CHLORATI ÆTHEREA.—Iron Chloride Solution, 1; Ether, 2; Alcohol (90 p.c.), 7. All by weight.—*Ger.*, *Ital.* and *Jap.*

FERRI PERNITRATIS LIQUOR.

SOLUTION OF FERRIC NITRATE.

A reddish-brown liquid, readily miscible with Water. It contains Ferric Nitrate, $\mathbf{Fe_2 6NO_3}$, eq. 480·68, in solution.

Medicinal Properties.—Tonic, astringent and escharotic. Like the Ferric Chloride it is useful in hæmatemesis and in hæmorrhage from the bowel, either by the mouth or as an injection with starch mucilage.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

110 minims contain 3⅓ grains of Iron; 100 c.c. contain 3·3 grammes.

Foreign Pharmacopœias.—Not in any.

Tests.—Ferric Nitrate Solution has a specific gravity of 1·107 to 1·109. It should answer the tests distinctive of Ferric salts given under Ferrum. The diluted solution, when mixed with an equal volume of Sulphuric Acid, keeping the liquid cool meanwhile, yields a dark-brown ring when a solution of Ferrous Sulphate is gently floated on to the surface of the liquids. It is officially required to yield 4·6 p.c. w/v of Iron Oxide, when a measured quantity of 5 c.c. is precipitated with Ammonia Solution in excess, and the precipitate is washed, dried, ignited, and weighed; the residue amounting to 0·23 gramme. It should be free from the impurities mentioned under Liquor Ferri Perchloridi Fortis, Nitrates excepted.

FERRI PHOSPHAS.

IRON PHOSPHATE.

A dull, greyish-blue, amorphous, odourless powder, which is officially required to contain not less than 47 p.c. of Hydrous Ferrous Phosphate, $\mathbf{Fe_3(PO_4)_28H_2O}$, eq. 498·48 together with Ferric Phosphate and Iron Oxide.

Solubility.—Insoluble in Water, but soluble in Hydrochloric Acid.

Medicinal Properties.—A valuable hæmatinic tonic. Given in anæmia, in amenorrhœa, some forms of dyspepsia, rachitis and tubercular bone diseases; in nervous depression and exhaustion with tendency to phosphaturia, and during convalescence.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Prescribing Notes.—*Given in* **cachets, pills,** *or* **powders.** *A good pill can be made by adding one-third of its weight of 'Diluted Glucose.'*

Official Preparations.—Syrupus Ferri Phosphatis, Syrupus Ferri Phosphatis cum Quinina et Strychnina.

Not Official.—Syrupus Triplex, Syrupus Tres, Elixir Ferri Quininæ et Strychninæ Phosphatum, Glyceritum Ferri Quininæ et Strychninæ Phosphatum, Pilula Ferri Quininæ et Strychninæ Phosphatum, Liquor Ferri Phosphatis Fortis, Pilula Trium Phosphatum, Syrupus Ferri Phosphatis Compositus, Squire's Chemical Food, Syrupus Ferri Phosphatis c. Manganesio. Ferri Phosphas Solubilis, Ferri Pyrophosphas Solubilis.

Foreign Pharmacopœias.—Official in Span. (Fosfato de Hierro), U.S. (Soluble Ferric Phosphate), Mex. (Fosfato Ferroso-Ferrieo). Not in the others.

Tests.—Iron Phosphate dissolves in Hydrochloric Acid, yielding a solution which gives with Potassium Ferrocyanide and with Potassium Ferricyanide Solutions the tests distinctive of Ferric and Ferrous salts given under Ferrum. On the addition of Tartaric Acid and an excess of Ammonia Solution it yields on the subsequent addition of Magnesium Ammonio-sulphate Solution a white granular precipitate. It is officially required to contain not less than 47 p.c. of hydrous Ferrous Phosphate, as determined by the titration of a solution of 1 gramme in Hydrochloric Acid, with Volumetric Potassium Bichromate Solution, using Potassium Ferricyanide Solution as an indicator, at least 28·2 c.c. of the Volumetric Solution should be necessary. Arsenic may be present as an impurity, and may be tested for by the Bettendorf's test.

Preparations.

SYRUPUS FERRI PHOSPHATIS. Syrup of Ferrous Phosphate.

Iron, in Wire, 75 grains; Concentrated Phosphoric Acid, 1¼ fl. oz.; Syrup, 14 fl. oz.; Distilled Water, *q.s.* to make 20 fl. oz. of a pale green syrupy liquid, containing 1 grain of anhydrous Ferrous Phosphate in 60 minims.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

This Syrup can be conveniently made by adding 1 volume of Liquor Ferri Phosphatis Fortis to 5½ vols. of Simple Syrup and 1½ vols. of Distilled Water.

Ferrous Phosphate absorbs Oxygen with great rapidity on exposure to air, and requires such a large excess of Acid to keep it in solution that in framing a formula for Syrupus Ferri Phosphatis a compromise must be made between liability to deposit on the one hand and acidity on the other. We think it is better to use a comparatively small excess, and keep the Syrup in small bottles lying down.

SYRUPUS FERRI PHOSPHATIS CUM QUININA ET STRYCHNINA. Syrup of Phosphate of Iron with Quinine and Strychnine.

Iron, in Wire, 75 grains; Concentrated Phosphoric Acid, 1¼ fl. oz.; Strychnine, in powder, 5 grains; Quinine Sulphate, 130 grains; Syrup, 14 fl. oz.; Distilled Water, *q.s.* to make 20 fl. oz. of a pale yellowish-green syrupy liquid, possessing a very bitter taste, and having a strong fluorescence; it contains 1 grain of anhydrous Ferrous Phosphate, ⅘ grain of Quinine Sulphate, and $\frac{1}{32}$ grain of Strychnine in 60 minims.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

It resembles the compound known as Easton's Syrup.

It can be made extemporaneously by dissolving 2 grains of Strychnine and 51 grains of Quinine Sulphate in 24 minims of Concentrated Phosphoric Acid and Distilled Water to 1½ fl. oz.; Liquor Ferri Phosphatis Fortis, 1 fl. oz.; Syrup, to make 8 fl. oz.

This formula has been incorporated in the *B.P.C.* under the title **Liquor Quininæ et Strychninæ.**

Foreign Pharmacopœias.—Official in U.S. Not in the others.

A mixture of Easton's, Fellows' and Parrish's Syrups is sold as '**Triple Syrup.**'

Syrupus Triplex.—Syrupus Ferri Phosphatis Compositus, 2 fl. oz.; Syrupus Ferri Hypophosphitis Compositus, 1 fl. oz.; Syrupus Eastoni, 1 fl. oz.—*Pharm. Form.* The **Syrupi Tres** of the *Edinburgh Royal Infirmary* is the same.

Martindale (1904) and *B.P.C.* (1907) give the proportions as an equal volume of each.

Not Official.

ELIXIR FERRI QUININÆ ET STRYCHNINÆ PHOSPHATUM.—Soluble Ferric Phosphate, 1·75; Quinine, 0·875; Strychnine, 0·0275; Phosphoric Acid, 0·20; Ammonium Carbonate, 0·90; Alcohol (95 p.c.), 6·00; Acetic Acid, 2·865; Ammonia Water, *q.s.*; Distilled Water, *q.s.*; Aromatic Elixir, *q.s.* of each to produce 100.—*U.S.P.*

Average Dose. 1 fl. drm. = 3·6 c.c.

This has been incorporated in the *B.P.C.* with slight modification.

Soluble Iron Phosphate, 1·75; Quinine, 0·875; Strychnine, 0·0285; Concentrated Phosphoric Acid, 0·25; Ammonium Carbonate, 0·90; Alcohol, 6·25; Acetic Acid, 2·75; Solution of Ammonia, Distilled Water and Aromatic Elixir, *q.s.* of each to produce 100.—*B.P.C.*

In the *B.P.C. Supplement* the 1·75 of Soluble Iron Phosphate is replaced by 1·35 of Ferric Citrate, and sufficient Sodium Phosphate to give the solution a distinctly green coloration.

GLYCERITUM FERRI QUININÆ ET STRYCHNINÆ PHOSPHATUM (*U.S.*).—Soluble Ferric Phosphate, 8; Quinine, 10·4; Strychnine, 0·08; Phosphoric Acid, 20; Glycerin, 50; Water, *q.s.* to make 100.—*U.S.P.*

The **Average Dose,** 15 minims, contains about 1⅐ grains of Ferric Phosphate, 1½ grains of Quinine, 1/87 grain of Strychnine.

This has been incorporated in the *B.P.C.*

It is used for preparing Syrupus Ferri Quininæ et Strychninæ Phosphatum, *U.S.P.*, by mixing Glycerite 1 with Syrup 3, but the Syrup so produced is very different from the corresponding preparation in the *B.P.* It contains in each fl. drm. about 1⅐ grains of Ferric Phosphate, 1½ grains of Quinine, 1/87 grain of Strychnine.

LIQUOR FERRI PHOSPHATIS FORTIS.—Containing 8 grains per fl. drm. of the Anhydrous Phosphate; is made by dissolving 360 grains of Iron Wire in 6 fl. oz. of Concentrated Phosphoric Acid, with sufficient Water to make 12 fl. oz.

PILULA FERRI QUININÆ ET STRYCHNINÆ PHOSPHATUM.—Ferrous Phosphate, 1 grain; Quinine Sulphate, 1 grain; Strychnine, 1/32 grain; Milk Sugar, 1¼ grains; Concentrated Phosphoric Acid, *q.s.* for one pill.—*Martindale.*

It is also made half this strength, and either may be combined with Arsenious Acid 1/60 grain.—*Martindale.*

Pilulæ Ferri Phosphatis cum Quinina et Strychnina. *Syn.* Easton's Pills.—In 100 parts, Ferrous Phosphate, 20; Quinine Sulphate, 20; Strychnine, 0·62; Milk Sugar, a sufficient quantity; Concentrated Phosphoric Acid, *q.s.* to form a mass. Divide into pills containing 2 grains each.—*B.P.C.*

Note.—Easton's Pills are sometimes made twice the size specified above; and they may be ordered with the addition of 1/64 grain of Arsenious Acid.—*B.P.C.*

Although the *B.P.C.* form resembles that of *Martindale*, it is not nearly so definite in strength.

Pilula Trium Phosphatum. Easton's Pill.—Iron Phosphate, 1 grain; Quinine Sulphate, 1 grain; Strychnine, 1/32 grain; Concentrated Phosphoric Acid, 1½ minims; Liquorice Powder, to 4 grains.—*Guy's.*

SYRUPUS FERRI PHOSPHATIS COMPOSITUS.—Iron Wire, free from Oxide, 37½ grains; Concentrated Phosphoric Acid (sp. gr. 1·5), 1 fl. oz.; Distilled Water, 5 fl. drm.; dissolve by a gentle heat in a flask plugged with Cotton-Wool, the Iron being completely covered by the liquid.

Precipitated Calcium Carbonate, 120 grains; Concentrated Phosphoric Acid, 4 fl. drm.; Distilled Water, 2 fl. oz.; mix, and add Potassium Bicarbonate, 9 grains; Sodium Phosphate, 9 grains, filter, and set aside.

Cochineal, 30 grains; Distilled Water, 7½ fl. oz.; boil for 15 minutes, and when cooled filter, pouring over the filter a sufficient quantity of Distilled Water to produce 7 fl. oz. of filtrate; to this add Refined Sugar, 14 oz.; heat till dissolved, and strain. When cold, add the Iron and Calcium Solutions and sufficient Distilled Water to produce 20 fl. oz.—*B.P.C. Formulary* 1901.

This has been incorporated in the *B.P.C.*, employing 288 minims of Orange Flower Water in place of that quantity of Distilled Water in the quantities given above, but the *B.P.C. Supplement* has since altered the quantity to 480 minims.

Each fl. drm. = ⅛ grain Ferrous Phosphate and ⅛ grain Calcium Phosphate with small quantities of Potassium and Sodium Phosphates. It should be kept in bottles quite full.

Dose.—½ to 2 fl. drm. = 1·8 to 7·1 c.c.

SYRUPUS FERRI PHOSPHATIS COMPOSITUS, SQUIRE (Squire's Chemical Food).—The preparation, made for many years by Parrish, was imported and subsequently purchased by Squire.

It contains Ferrous Phosphate, Calcium Phosphate, Sodium Phosphate and Potassium Phosphate.

Dose.—½ to 1 teaspoonful, in Water, with meals.

A formula was published many years ago, but how far this has been a success is shown by comparing the Syrups commercially sold, all of them more or less emphatically stated to be made according to the published formula.

In nine samples analysed, the Iron Phosphate ranged from 0·19 to 0·66, the Calcium Phosphate from 0·5 to 1·6, the total Phosphoric Acid from 1·5 to 4·7; these results are expressed in grains per fl. drm.

Medicinal Properties.—A tonic in debility, of whatever origin, and during convalescence from acute diseases. Specially indicated in tuberculosis and rickets, and during pregnancy.

SYRUPUS FERRI PHOSPHATIS C. MANGANESIO.—Dissolve 100 grains Manganese Phosphate in 1¼ fl. oz. of Liquor Ferri Phosphatis Fortis and 30 minims of Phosphoric Acid, then dilute to 20 fl. oz. with Simple Syrup.

This Syrup will contain in each fl. drm. ½ grain each of anhydrous Ferrous Phosphate and anhydrous Manganese Phosphate.

Dose.—1 fl. drm. = 3·6 c.c.

This can sometimes be taken when Syrup of Ferrous Phosphate disagrees.

FERRI PHOSPHAS SOLUBILIS. Soluble Ferric Phosphate. (*U.S.*).—Prepared by dissolving Ferric Citrate and Sodium Phosphate in Distilled Water, evaporation and scaling on plates of glass. The scales are transparent and of a bright green colour, freely soluble in Water; they, however, become dark and discoloured on exposure to air. It is used in the preparation of Elixir Ferri Quininæ et Strychninæ Phosphatum (*U.S.*), Glyceritum Ferri Quininæ et Strychninæ Phosphatum (*U.S.*), and Syrupus Ferri Quininæ et Strychninæ Phosphatum (*U.S.*) (from Glycerite).

FERRI PYROPHOSPHAS SOLUBILIS. Soluble Ferric Pyrophosphate (*U.S.*).—Prepared by dissolving Ferric Citrate and Sodium Pyrophosphate in Distilled Water, evaporation and scaling on plates of glass. The scales are transparent and of an apple-green colour, freely soluble in Water.

FERRI SULPHAS.

FERROUS SULPHATE.

Fr., Sulfate de Protoxide de Fer Officinal; Ger., Ferrosulfat;
Ital., Solfato Ferroso; Span., Sulfato Ferroso.

$FeSO_4.7H_2O$, eq. 276·10.

Large, translucent, pale green, odourless, monoclinic prisms, having a saline, styptic, ferruginous taste.

Ferrum Sulphuricum Præcipitatum (*Austr.*), resembles the Ferri Sulphas Granulata of *B.P.* '85, omitted in 1898. It is obtained by pouring an aqueous solution of Ferrous Sulphate into Alcohol (90 p.c.).

Solubility.—1 in 1½ of Water; the solution rapidly oxidises on exposure; insoluble in Absolute Alcohol or Alcohol (60 p.c.), hence it cannot be dissolved in Tinctures.

Medicinal Properties.—A powerful astringent and a hæmatinic tonic, but is apt to irritate the stomach. Internally it is given in anæmia, amenorrhœa, and general debility; along with Quinine it promotes the appetite; given with cathartics, such as Magnes. Sulph. and Aloes, to increase their action, but at the same time reduce their dose; externally it is used as a **lotion** for ulceration and erysipelatous surfaces, 3 to 5 grains in an oz. of Water; also as an **injection** for urethral and vaginal inflammations and prolapse of rectum.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

Prescribing Notes.—*Given in solution or more generally pill form, to avoid gastric irritation. The* **Dried Sulphate** *is best in pills; 3 grains, which are equal to 5 of the crystallised salt, make a nice pill with 'Diluted Glucose.'*

Liquor Ferri Persulphatis is an excellent **styptic.**

2 grains of Ferrous Sulphate, 30 grains of Magnesium Sulphate, 5 minims of Diluted Sulphuric Acid, Chloroform Water or Peppermint Water to 1 oz.; occurs in Hospital formulas as **Mistura Ferri Aperiens.**

Official Preparations.—Ferri Sulphas Exsiccatus and Liquor Ferri Persulphatis. *See* also 'Ferrum.'

Not Official.—Liquor Ferri Subsulphatis (Monsel's Solution), Mistura Ferri et Magnesii Sulphatis, Mistura Ferri Aperiens, Monsel's Salt, Gossypium Ferratum, and Ferri et Ammonii Sulphas.

Foreign Pharmacopœias.—Official in Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Norw., Port., Russ., Span., Swed., Swiss and U.S.; Mex. (Sulfato Ferroso); Fr., Ger., Jap., Russ. and Swiss have a Crude Sulphate; Austr. has a Precipitated Sulphate; U.S. a Granulated Sulphate.

Tests.—Ferrous Sulphate should dissolve to form a clear solution in less than 2 parts of cold Water. The aqueous solution answers the tests distinctive of Ferrous salts given under the heading of Ferrum. Acidified with Hydrochloric Acid its solution yields with Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid.

It is officially required to contain 99·4 p.c. of crystallised Ferrous Sulphate as determined by titration with Volumetric Potassium Bichromate Solution, using Potassium Ferricyanide Solution as an indicator. The *U.S.P.* salt is required to contain not less than 99·5 p.c. pure Ferrous Sulphate. The processes of determination are compared in the small type below under the heading of Volumetric Determination.

The more generally occurring impurities are Ammonium, Copper, Potassium, Sodium and Zinc, and Ferric salts. They are best detected by oxidising the aqueous solution with Nitric Acid and precipitating the Iron as Ferric Hydroxide with Ammonia Solution. The filtrate should not be blue in colour nor yield a precipitate on the addition of Hydrogen Sulphide, indicating the absence of Copper and Zinc; another portion of the filtrate evaporated to dryness and ignited should not leave a weighable residue, indicating the absence of Potassium and Sodium salts. The *B.P.* uses Hydrogen Sulphide as a test for Ferric salts. It should dissolve 1 in 1½ of Water as stated above, and the solubility of the sample in less than 2 parts of cold Water is officially included as a test for the absence of Oxysulphate.

Hydrogen Sulphide.—If 2 grammes of the salt in aqueous solution be oxidised with Nitric Acid or Bromine Water, and excess of T.S. of Ammonia be added to the solution obtained, the filtrate from this mixture should be colourless and should not be affected by T.S. of Hydrogen Sulphide, *P.G.* This test is also given in the *U.S.P.* 1 gramme of the salt dissolved in 25 c.c. of Water containing 1 c.c. diluted Sulphuric Acid is heated to boiling and oxidised with Nitric Acid. A slight excess of T.S. of Ammonia is then added and the mixture filtered. A colourless filtrate is obtained which should not respond to the time-limit test for heavy metals. The colourless filtrate obtained as in the preceding test should not on evaporation and ignition leave a weighable residue, *P.G.* and *U.S.P.*

Volumetric Determination.—An aqueous solution of 1 gramme of Iron Sulphate acidified with Sulphuric Acid requires at least 36 c.c. of Volumetric Solution of Potassium Bichromate, *B.P.*; the *U.S.P.* directs that 1·38 grammes of the salt in uneffloresced crystals be dissolved in 25 c.c. of dilute Sulphuric Acid and the solution titrated with Tenth-normal Volumetric Solution of Potassium Permanganate; not less than 49·75 c.c. of the Volumetric Solution should be necessary to impart a permanent pink colour to the liquid.

Preparations.

FERRI SULPHAS EXSICCATUS. EXSICCATED FERROUS SULPHATE. DRIED SULPHATE OF IRON.—*B.P.* '85.

Ferrous Sulphate, submitted to a temperature of 100° C. (212° F.), until it ceases to lose aqueous vapour; reduce to a fine powder and keep in dry, well-stoppered bottles. It should be slowly but completely soluble in Water.

Dose.—½ to 3 grains = 0·032 to 0·20 gramme.

3 grains are equal to 5 grains of Ferrous Sulphate.

Foreign Pharmacopœias.—Official in Dan. and Swed., dried at 104° to 122° F. (40° to 50° C.); Ger., Swiss and U.S., dried at 212° F. (100° C.); Dutch, Fr., Russ. and Span., no temperature given. Not in the others.

Tests.—Dried Ferrous Sulphate dissolves slowly but completely in Water, the solution answers the tests distinctive of Ferrous salts given under Ferrum. The 1 in 20 aqueous solution acidified with Hydrochloric Acid yields with Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid. It is officially required to contain at least 92·5 p.c. of dried Ferrous Sulphate of the official formula, as determined by titration with Volumetric Potassium Bichromate Solution, using Potassium Ferricyanide Solution as an indicator. The processes of the *B.P.* and *P.G.* are compared below under the heading of Volumetric Determination. It should, of course, be free from the impurities mentioned under Ferrous Sulphate, but *B.P.* does not say so. A standard suggested for Arsenic (*C.D.* '08, i. 796) is 2 parts per million.

Volumetric Determination.—A solution of 1 gramme of the salt in water acidified with Sulphuric Acid requires at least 54·6 c.c. of the Volumetric Solution of the Potassium Bichromate. This corresponds to at least 92·5 p.c. of Exsiccated Ferrous Sulphate $FeSO_4.H_2O$, *B.P.*; the *P.G.* gives the following directions:—Let 0·2 gramme of the salt be dissolved in 10 c.c. of diluted Sulphuric Acid and the solution mixed with Solution of Potassium Permanganate (5–1000) until a faint reddening occurs. After the colour is destroyed, which may be effected if necessary by a few drops of Alcohol, 2 grammes of Potassium Iodide are added and the mixture is allowed to stand for 1 hour at ordinary temperature in a closed vessel. It is then titrated with Tenth-normal

Volumetric Solution of Sodium Thiosulphate, of which at least 10·8 c.c. should be necessary for the combination of the free Iodine, *P.G.*

LIQUOR FERRI PERSULPHATIS. SOLUTION OF FERRIC SULPHATE.

Ferrous Sulphate, 16; Sulphuric Acid, 1½; Nitric Acid, 1½; Distilled Water, *q.s.* to make 22 of a reddish-brown liquid, sp. gr. 1·441, miscible with Water and Alcohol (90 p.c.).

Introduced for making several preparations of Iron, which are enumerated under 'Ferrum,' p. 504.

Foreign Pharmacopœias.—Official in Ital., Jap. and Swiss, sp. gr. 1·428 to 1·430; Russ., sp. gr. 1·426 to 1·430; U.S., sp. gr. 1·430 to 1·450 at 25° C. (77° F.). Not in the others.

Tests.—Ferric Sulphate Solution is officially required to possess a specific gravity of 1·441. Its diluted aqueous solution should answer the tests for Ferric salts given under Ferrum. It should yield when diluted with 10 times its volume of Water a brown but no pronounced blue coloration with Potassium Ferricyanide Solution, indicating the absence of more than a trace of Ferrous salt. It should not decolorise Potassium Permanganate Solution. It is officially required to yield 1·04 grammes of Iron Oxide, as gravimetrically determined by precipitation as Hydroxide with Ammonia Solution, washing, drying and incinerating. The *U.S.P.* Liquor is required to contain 36 p.c. of Normal Ferric Sulphate [$Fe_2(SO_4)_3$ eq. 397·05], corresponding to not less than 10 p.c. of metallic Iron. The *U.S.P.* employs a volumetric Iodometric method for the determination of Iron. The respective processes are compared in small type below under the headings Gravimetric and Volumetric Determinations.

The liquor should be free from the impurities mentioned under Ferrous Sulphate.

Potassium Ferricyanide.—A small portion of the solution diluted with about 10 volumes of Water should yield with a few drops of freshly-prepared T.S. of Potassium Ferricyanide a pure brown colour without a tinge of green or greenish-blue, *U.S.P.*

Sulphuric Acid.—If 2 volumes of the solution be slowly mixed with 1 volume of concentrated Sulphuric Acid in a beaker, no solid white mass should separate, *U.S.P.*

Ferrous Sulphate and Sulphuric Acid.—If a crystal of Ferrous Sulphate be added to a diluted portion of the solution (about 1–10), mixed with an equal volume of concentrated Sulphuric Acid and cooled, the crystal should not become brown nor should a brownish-black colour develop around it, *U.S.P.*

Gravimetric Determination.—The reddish-brown precipitate produced when a measured quantity of 5 c.c. of the Liquor diluted with 80 c.c. of Water is treated with Ammonia Solution in excess, should when washed, dried, ignited, cooled and weighed amount to 1·04 grammes, *B.P.*

Volumetric Determination.—A weighed quantity of 1·11 gramme is introduced into a glass-stoppered bottle of about 100 c.c. capacity together with 15 c.c. of Water and 2 c.c. of Hydrochloric Acid. 1 gramme of Potassium Iodide is added and the mixture kept at a temperature of 40° C. (104° F.) for half an hour, then cooled and titrated with Tenth-normal Volumetric Sodium Thiosulphate Solution, using Starch Solution as an indicator; not less than 20 c.c. shall be required to discharge the blue or greenish colour of the liquid. 1 c.c. of Tenth-normal Thiosulphate = 0·5 p.c. w/w metallic Iron, *U.S.P.*

Not Official.

MISTURA FERRI ET MAGNESII SULPHATIS.—Sulphate of Iron, 3 grains; Magnesium Sulphate, 30 grains; Dilute Sulphuric Acid, 5 minims; Distilled Water, to 1 fl. oz.—*Royal Free.*

Ferrous Sulphate, 2 grains; Magnesium Sulphate, 20 grains; Diluted Sulphuric Acid, 10 minims; Water, to 1 fl. oz.—*King's.*

Mistura Ferri Aperiens.—Ferrous Sulphate, 2 grains; Magnesium Sulphate, 30 grains; Diluted Sulphuric Acid, 2 minims; Peppermint Water, to 1 fl. oz.—*University.*

LIQUOR FERRI SUBSULPHATIS (*U.S.*).—An aqueous solution of basic Ferric Sulphate, corresponding to not less than 13·57 p.c. of Iron. It is known as **Monsel's Solution.**

Monsel's Salt is produced by evaporating and scaling the solution.

GOSSYPIUM FERRATUM.—Moisten Cotton-Wool with Glycerin, then express strongly; steep the damp Wool in a solution of Ferrous Sulphate, 1 part to 2 parts of Water, squeeze out as much as possible of the liquid, and, without drying, pack the prepared wool into a bottle furnished with a glass stopper.

FERRI ET AMMONII SULPHAS. Ammonio-Ferric Alum.—Iron Alum is an Alum in which Iron takes the place of Aluminum. Pale violet octahedral crystals, which are efflorescent. It should contain 99·5 p.c. of pure uneffloresced Ferric Ammonium Sulphate.

Solubility.—Soluble 1 in 3 of Water, insoluble in Alcohol (90 p.c.).

It is used in bleeding from the kidneys; it arrests the hæmorrhage and the anæmia that accompanies it; it is considered more astringent than Alum.

The aqueous solution will, even after filtration, deposit unless slightly acidified with Diluted Sulphuric Acid.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Foreign Pharmacopœias.—Official in U.S.

Tests.—Ferric Ammonium Sulphate dissolved in Water yields a blue precipitate with Potassium Ferrocyanide Solution and a brownish-red precipitate with Potassium Hydroxide Solution, followed by the evolution of Ammonia gas on warming. The aqueous solution gives with Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid. A weighed quantity of 0·555 gramme of the uneffloresced crystals is dissolved in 15 c.c. of Water and 2 c.c. of Hydrochloric Acid, in a 100 c.c. glass-stoppered flask, 1 gramme of Potassium Iodide is added, the flask securely fastened, the mixture kept for half an hour at 40° C. (104° F.), and then cooled; not less than 11·5 c.c. of Tenth-normal Volumetric Sodium Thiosulphate Solution should be required to discharge the colour. 1 c.c. of Tenth-normal Thiosulphate = 1 p.c. of metallic Iron.

FERRUM REDACTUM.

REDUCED IRON.

Fr., Fer Réduit par l'Hydrogène; Ger., Reduzirtes Eisen; Ital., Ferro Ridotto dall' Idrogeno; Span., Hierro Reducido por el Hidrogeno.

A fine, tasteless powder, possessing a dull iron-grey metallic appearance, and strongly attracted by a magnet. It is officially required to contain at least 75 p.c. of metallic Iron, with a variable amount of Iron Oxide. It is prepared by the reduction of Ferric Hydroxide, at a dull red heat, by dry Hydrogen.

With reference to the keeping qualities of Reduced Iron, it may be noted that, under ordinary atmospheric conditions, a sample containing 91·5 p.c. of Iron, loosely covered with paper to keep out dust, lost only 1 p.c. of metallic Iron in a month.

Medicinal Properties.—Hæmatinic. Given in chlorosis and amenorrhœa.

As Hydrogen is evolved by its contact with the acid gastric secretion, flatulence may be set up.

Dose.—1 to 5 grains = 0·065 to 0·32 gramme.

Prescribing Notes.—*Given in powder, pill, or in lozenges. Pills containing Reduced Iron have a tendency to crack. An excellent pill can be made by mixing Reduced Iron* 24 *grains, Liquorice Powder* 6 *grains, Glycerin of Tragacanth* 6 *grains, and dividing into* 12 *or more pills as desired.*

Official Preparation.—Trochiscus Ferri Redacti.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—Reduced Iron dissolves in Hydrochloric Acid, and Hydrogen gas is at the same time evolved. The solution thus yielded gives the tests distinctive of Ferrous salts given under Ferrum, and on oxidation with Nitric Acid the tests distinctive of Ferric salts also given under Ferrum.

It is officially required to contain at least 75·48 p.c. of metallic Iron as determined by the titration with Volumetric Potassium Bichromate Solution of the Ferrous Sulphate produced when an excess of Copper Sulphate in solution is decomposed by a weighed quantity of Reduced Iron, Potassium Ferricyanide Solution being used as an indicator. The equivalent amount of Copper is precipitated from a hot solution of 1 gramme of Copper Sulphate in 15 c.c. of Water by the addition of a weighed quantity of 0·25 of a gramme of the Reduced Iron, 10 minutes is allowed for the completion of the reaction. The resulting solution of Ferrous Sulphate is filtered with as little exposure to the air as possible and acidified with Sulphuric Acid, it should require at least 33·7 c.c. of Deci-normal Volumetric Bichromate Solution. Both *U.S.P.* and *P.G.* employ Iodometric methods, which are described below in small type under the heading Volumetric Determination. The *B.P.* 1898 raised the percentage of metallic Iron from 50 to at least 75·5 p.c., but there is no difficulty in obtaining Reduced Iron containing over 90 p.c. of metal. It has been pointed out (*C.D.* '99, ii. 214; *P.J.* '99, ii. 109) that the Copper Sulphate method is not satisfactory, and that either one of the other two methods tried is to be preferred (these were the Iodometric process and the 'Mercuric Chloride' process official in the *U.S.* '90, which have now been abandoned in favour of the Iodine method).

The *B.P.* does not include specific tests for impurities, with the exception of Sulphur, which is officially stated to be recognised by an odour of Hydrogen Sulphide during solution; both *U.S.P.* and *P.G.* employ Lead Acetate paper. The more generally occurring impurities, other than the above, are Arsenic, Copper, Silica, Carbon, and alkali Carbonates. Arsenic may be detected by the modified Gutzeit's test, after the preliminary precipitation indicated below, or by the Bettendorf's test. It has been suggested that a limit of Arsenic should be included in the *B.P.* The *U.S.P.* adopts a limit of 1 in 100,000. A limit of 0·05 p.c. has been suggested (*C.D.* '01, ii. 242), and this standard is upheld (*Y.B.P.* '03, 242). It is stated (*C.D.* '08, i. 796) that a standard of 0·02 p.c. appears to be a sufficiently stringent limit for Arsenic in Reduced Iron. Copper may be detected by Hydrogen Sulphide in a solution rendered faintly acid with Hydrochloric Acid, or it may be detected by oxidising the Ferrous salt to the Ferric condition, precipitating the Iron as Ferric Hydroxide with Ammonia Solution and examining the filtrate. The limit might be fixed at 1 in 5,000. Silica and Carbon may be detected by the residue insoluble in Hydrochloric Acid, which should not amount to more than 1 p.c. Alkali salts may be detected by the reaction towards red Litmus paper of the water with which the sample has been shaken, and by the residue left on evaporation of the same after filtration.

Stannous Chloride.—Let 0·2 gramme of Reduced Iron and 0·2 gramme of Potassium Chlorate be mixed with 2 c.c. of Hydrochloric Acid in a large test glass, and after the reaction ceases the mixture be warmed until free Chlorine is expelled. The solution is then filtered. 1 c.c. of the filtrate so obtained, with the addition of 3 c.c. of T.S. of Stannous Chloride, should not assume a dark colour in the course of an hour, *P.G.*

Modified Gutzeit's Test.—The *U.S.P.* gives the following instructions for treating Reduced Iron before proceeding to test for Arsenic :—'To 0·5 gramme of Reduced Iron contained in a small covered beaker, add 20 c.c. of diluted Sulphuric Acid. After the reaction has somewhat subsided, warm the liquid on a water-bath until the reaction ceases, then collect any minute undissolved residue of impure Iron Arsenide upon a very small filter, rinse the beaker with Water, add the rinsings to the filter, and wash the residue with Water until free from acid reaction. Transfer the residue to the beaker by rinsing it back, and after adding about 0·25 gramme of Potassium Chlorate and 5 c.c. of Hydrochloric Acid evaporate the solution slowly to dryness on a water-bath. Dissolve the residue in sufficient Water to measure 50 c.c., then add 5 c.c. of this solution to 5 c.c. of a saturated Solution of Sulphurous Acid and heat the liquid on a water-bath for fifteen minutes, until all traces of Sulphurous Acid have been removed. The resulting solution should not respond to the modified Gutzeit's test for Arsenic.'

Volumetric Determination.—A weighed quantity of 0·555 gramme of Reduced Iron is introduced into a 100 c.c. flask containing about 2·6 grammes of Iodine, the weight of which is subsequently accurately recorded, 6 c.c. of Water and 2 grammes of Potassium Iodide are added, the flask is securely stoppered and set aside for one hour, sufficient Distilled Water is added to measure exactly 100 c.c., mixed well, and 25 c.c. of this solution removed, and after the addition of a few drops of Starch Test-solution it is titrated with Tenth-normal Volumetric Sodium Thiosulphate Solution. The weight of Iodine taken is divided by 0·02518, the quotient subtracted from twice the number of c.c. of Tenth-normal Volumetric Sodium Thiosulphate Solution used, and the remainder represents the percentage of metallic Iron present in the sample. Instead of employing the official Iodine for the test the percentage of purity of the Iodine may be ascertained by a separate experiment, and the equivalent quantity of pure (100 p.c.) Iodine may be used instead of the 2·6 grammes referred to above, *U.S.P.*

A weighed quantity of 0·3 gramme of finely-powdered Reduced Iron is mixed with 10 c.c. of T.S. of Potassium Iodide, and into this mixture is gradually introduced 1·5 grammes of powdered Iodine, cooling and shaking. As soon as the Iron and Iodine are completely dissolved, the liquid is diluted with Water to 100 c.c., allowed to stand and deposit. A measured quantity of 50 c.c. of the clear Solution is filtrated with Tenth-normal Volumetric Solution of Sodium Thiosulphate, of which not more than 10·3 c.c. should be necessary for combination with the free Iodine, *P.G.*

Preparation.

TROCHISCUS FERRI REDACTI. Reduced Iron Lozenge.

1 grain of Reduced Iron in each, with Simple Basis.

Dose.—1 to 6 lozenges.

FERRUM TARTARATUM.

TARTARATED IRON.

FR., FERRITARTRATE DE POTASSIUM; GER., KALIUMFERRITARTRAT; ITAL., TARTRATO FERRICO-POTASSICO; SPAN., TARTRATO FERRICO-POTASICO.

Thin, deep ruby-red, translucent, slightly deliquescent scales, having a sweetish, ferruginous and astringent taste.

It should be kept in well-closed vessels, of a dark amber tint, and protected as far as possible from air and light.

Solubility.—1 in 1 of Water (slowly); very sparingly in Alcohol (90 p.c.)

Medicinal Properties.—Chalybeate tonic, and slightly diuretic, suitable in the anæmia of convalescence.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Foreign Pharmacopœias.—Official in Belg. (Tartras Ferrico-Potassicus); Fr. (Ferritartrate de Potassium); Ital. (Tartrato Ferrico-Potassico); Mex. (Tartrato de Potasio y Fierro); Port. (Tartrato de Potassa e de Ferro); Russ. (Ferro-Kalium Tartaricum); Span. (Tartrato Ferrico-Potasico); U.S. (Ferri et Potassii Tartras). Not in the others.

Ferri et Ammonii Tartras is also official in U.S.

Tests.—Tartarated Iron dissolves slowly in Water. The solution answers the tests distinctive of Ferric salts given under Ferrum. It is stated to yield no dark blue coloration, but only a greenish turbidity with Potassium Ferricyanide Solution, but it always contains Ferrous salt, which precipitates with the Potassium Ferricyanide reagent.

If the precipitate produced by Potassium Hydroxide Solution be removed by filtration and the filtrate be slightly acidulated with Acetic Acid, it yields, as it cools, a crystalline deposit, more particularly if the filtrate is first mixed with a little Alcohol (90 p.c.). It is officially required to yield 30·0 p.c. of Ferric Oxide, as determined by incinerating a weighed quantity at a red heat, cooling, and washing the residue till free from Potassium Carbonate, which operation is not always an easy matter to complete. The *U.S.P.* preparation is required to contain Iron and Potassium Tartrate corresponding in amount to not less than 15 p.c. of metallic Iron. The *U.S.P.* method of determination is an Iodometric one, and is described below. If the Iron be removed from a 1 in 10 aqueous solution by boiling with an excess of Potassium Hydroxide Test-solution, the filtrate, when slightly acidified with Acetic Acid, will gradually deposit a white crystalline precipitate, *U.S.P.*

With Potassium Ferrocyanide Test-solution, the solution should not afford a blue colour or precipitate, unless it be acidulated with Hydrochloric Acid, *U.S.P.*

Ammonia.—The aqueous solution of the salt should not yield any precipitate with T.S. of Ammonia, but is rendered darker, *U.S.P.*

Volumetric Determination.—The *U.S.P.* gives the following instructions:—If 0·555 gramme of the dry salt be dissolved in 15 c.c. of Water and 2 c.c of Hydrochloric Acid, in a glass-stoppered flask having a capacity of about 100 c.c., and if after the addition of 1 gramme of Potassium Iodide, and securely closing the flask, the mixture be kept for half an hour at 40° C. (104° F.) and then cooled, it should require not less than 15 c.c. of Tenth-normal Volumetric Solution of Sodium Thiosulphate to discharge the colour of the liquid, Starch T.S. being used as indicator (each c.c. of Tenth-normal Volumetric Solution of Sodium Thiosulphate indicating 1 p.c. of metallic Iron).

FICUS.

FIGS.

FR., FIGUE; GER., FEIGEN; ITAL., FICHI; SPAN., HIGOS.

The dried fleshy receptacles of *Ficus Carica*, L.

Medicinal Properties.—Nutritious, laxative, and demulcent. Chiefly used medicinally in constipation. Cut open and heated, it forms a convenient cataplasm.

Official Preparation.—Contained in Confectio Sennæ.

Foreign Pharmacopœias.—Official in Port. (Figos Passados); U.S. Not in the others.

Descriptive Notes.—Dried Figs are usually imported in two forms, natural and pulled figs. Natural figs are fruits that have not been made supple by kneading and squeezing; pulled figs are those so treated, and are generally imported in small boxes, in which they have been packed by careful pressure. They are flattened, translucent, and have the characteristic taste of the fig. In dry weather they are covered with a saccharine efflorescence. Greek figs are inferior in quality, containing less pulp, and are smaller.

The fruit is sometimes called a syconus; it is a pyriform receptacle filled with female flowers, each of which contains a minute ovary which, when ripe, forms an achene, often erroneously called a seed. The male flowers are developed sparingly amongst bracts surrounding the minute tubular orifice at the apex.

Compound Syrup of Figs.—Under this title several preparations are made, containing the soluble laxative constituents of Figs and Senna.

FILIX MAS.

MALE FERN.

The Rhizome of *Aspidium Filix-mas*, Sw., carefully dried.

Medicinal Properties.—The powder of the rhizome is slightly tonic and astringent; chiefly used in the form of Liquid Extract as an anthelmintic for tapeworm.

Prescribing Notes.—*The Liquid Extract, which is an Oleo-resin, can be given in Milk, or made into an* **emulsion** *with 1 to 2 fl. drm. of very fresh Mucilage of Gum Acacia, or ½ to 1 drm. of powdered Acacia, and with Peppermint Water or Milk to form a 2 oz. draught; or in* **capsules.** *Best given in the early morning fasting after a purge on the previous day, so that the worm is not protected by food. It is more effective if the dose of Male Fern be divided into three portions* *and given at intervals of half an hour. It should be followed 12 hours afterwards by a brisk purgative (not Castor Oil) to clear away the dead worm.*

Under the headings Haustus, and Mistura, Filicis Maris, several formulas are given in the Pharmacopœias of the London Hospitals.

10 minims of Tincture of Senega recommended for each fl. drm. of liquid extract, as an emulsifying agent.—*P.J.* '02, ii. 369.

Official Preparation.—Extractum Filicis Liquidum.

Not Official.—Mistura Filicis.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Jap., Fr. (Fougère), Ger., Hung., Norw., Ital. (Felce Maschio), Port. (Feto Macho), Russ., Mex., Span. (Helecho Macho), Swed., Swiss, U.S. (Aspidium).

Descriptive Notes.—The rhizome, as met with in English commerce, is sometimes entire and sometimes cut in half longitudinally for facility in drying, and has the scaly bases of the leaf stalks or stipes attached to it, these being angular and about 1 inch long and about $\frac{1}{3}$ inch in diameter. The official description limits the size from 3 to 6 inches (7·5 to 15 cm.) in length, $\frac{3}{4}$ to 1 inch (2 to 2·5 cm.) in diameter. The rhizome should be green internally. It should not be kept more than one year. The *B.P.*, as well as the *P.G.* and *U.S.P.*, requires that the rhizome should not be kept more than a year, as the medicinal activity is decreased on keeping. An indication of its freshness when purchased is the yellowish-green tint of the rhizome and stipes when cut transversely. The *B.P.* requires that it should be collected late in the autumn, and divested of its roots, leaves and dead portions. The *U.S.P.* states that the chaff (*i.e.*, scales), together with the dead portions of the rhizome and stipes, should be removed, and only such portions used as have retained their internal green colour. The distinguishing feature of the rhizome is the presence in the transverse section of 10 large vascular bundles forming a circle, beyond which a number of small ones are scattered, the leaf stalks showing eight only in an irregular circle. In the intercellular spaces near the apex of the rhizome globular stalked glands are found, which do not occur in most of the allied ferns likely to be mistaken for it in this country, such as *A. Oreopteris*, Sw., and *Athyrium Filix-fœmina*, Roth. The scales of *A. Filix-mas*, Sw., have two glands at the base, but that of *A. spinulosum*, Sw., which has been found frequently in Germany mixed with the true rhizome, has them also on the margins of the scales. In S. Africa the root of *Aspidium athamanticum*, Kunze, is used as a tænicide under the name of 'Unkomokomo,' and in Continental commerce as 'Pannum.'

Tests.—The ash of Male Fern varies from 1·5 to 3·0 p.c., the insoluble portion of the ash from 0·1 to 0·5 p.c. A standard of not less than 5 p.c. has been suggested.

Preparation.

EXTRACTUM FILICIS LIQUIDUM. Liquid Extract of Male Fern.

Male Fern exhausted by percolation with Ether, and subsequent evaporation of the Ether.

It is referred to in the *U.S.P.* as Oleoresina Aspidii, and is prepared from Aspidium by percolation with Acetone.

Dose.—45 to 90 minims = 2·7 to 5·4 c.c.

For larger doses than 90 minims, see *L.* '88, ii. 1037; *B.M.J.* '89, i. 319; and particularly as to mode of administration, *L.* '94, ii. 255.

U.S. states that the granular-crystalline substance, which deposits on standing, should be thoroughly mixed with the liquid portion before use.

The activity of the Extract is supposed to be due to **Filicic Acid.**—*P.J.* (3) xxii. 84; and this varies in different samples from 0·71 to 9·59 p.c., reaching in one sample 13·07 p.c.—*P.J.* '97, ii. 85.

Foreign Pharmacopœias.—Official in Austr. and Russ. (Ext. Filicis Maris); Belg., Dan., Dutch, Ger., Jap., Norw., Swed. and Swiss (Ext. Filicis); Fr. (Extrait de Fougère Mâle); Hung. (Extract. Filicis Maris Æthereum); Ital. (Estratto di Felce Maschio Etereo); Port. (Extracto de Feto Macho Ethereo); Span. (Aceite de Helecho Macho); U.S. (Oleoresina Aspidii). All made with Ether.

Test.—Fluid Extract of Male Fern has a specific gravity of 1·008 to 1·010.

Not Official.

MISTURA FILICIS. Liquid Extract of Male Fern, 1; Powdered Acacia, 1; Chloroform Water, to 8.—*University.*

FŒNICULI FRUCTUS.

FENNEL FRUIT.

FR., FENOUIL DOUX; GER., FENCHEL; ITAL., FINOCCHIO;
SPAN., HINOJO.

The dried ripe Fruit of *Fœniculum capillaceum*, Gilib., from cultivated plants.

Medicinal Properties.—Stimulant, aromatic, and carminative. In action similar to Anise. Antispasmodic in intestinal colic of children.

In infants an infusion (1 to 60) is employed as an enema for the expulsion of flatus.

Official Preparation.—Aqua Fœniculi. Used in the preparation of Pulvis Glycyrrhizæ Compositus.

Not Official.—Oleum Fœniculi.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr. (Fenouil Doux), Ger., Hung., Jap., Norw., Ital. (Finocchio), Port. (Funcho), Russ., Mex. and Span. (Hinojo), Swed., Swiss and U.S.

Descriptive Notes.—A number of different varieties of Fennel fruits are met with in commerce, varying from 3 to 4 mm. (Japanese) to 8 to 10 mm. (Saxon) in length, and from 1·5 mm. (Russian) to 3 mm. (French and Saxon) in diameter. The larger fruits are usually slightly curved, and greenish or greenish-brown in colour, according to age and ripeness when collected. The mericarps are usually united, and taper at the apex, and the longitudinal ridges are prominent with six large vittæ in each mericarp, two being on the flat, and four on the convex side. The different kinds vary in the percentage of Oil and in the relative percentage of Anethol and Fenchone that they contain. The Indian fruit, which yields the smallest percentage of oil, is referred to, *F. panmorium*, D.C., which, however, is regarded by some botanists as only a variety of *F. capillaceum.*

Fennel fruits, after distillation, are used in cattle foods, and to adulterate powdered Fennel fruits. The directions given in the *B.P.* limit the Fennel fruits to those 5 to 10 mm. long and 3 mm. in diameter; these include the Saxon and the cultivated French varieties, unless the Persian, Indian and Galician, which come within the limits of length, but are rather less in diameter than the official measurement, could be considered to be not excluded by the term 'about' prefixed to the official measurement. So far as flavour is concerned the Saxon, French, Macedonian, Persian, and Japanese are the best. Under the microscope the powder is characterised by the spiral and reticulated thin-walled colourless parenchymatous cells of the mesocarp, and the obliquely arranged thin-walled linear oblong cells, about 3 to 5 times as long as broad, of the inner epidermis, and the absence of striation on the cells of the outer epidermis.

Tests.—The ash of Fennel Fruit should amount to not more than 10 p.c. The ash of four samples determined in the author's laboratory amounted to 8·47, 8·93, 9·75 and 7·70 p.c. The ash of six samples of the Pulvis to 10·85, 12·8, 9·90, 8·91, 13·0 and 9·89 p.c. Good Fennel fruits yield from 3 to 5 p.c. of volatile oil.

Preparation.

AQUA FŒNICULI. Fennel Water.

Fennel Fruit, 1; Water, 20. Distil 10. (1 in 10)

Dose.—1 to 2 fl. oz. = 28·4 to 56·8 c.c.

Foreign Pharmacopœias.—Official in Austr., 1 in 20; Ital., Mex. and Port., 1 in 4; Ger., Jap. and Russ., 1 in 30; Hung. and Swed., 1 in 10; Dutch and Swiss, 1 in 25; Belg., Oil 1, Alcohol 99, Water 3300; Dan., with Oil, 1 in 2000; and U.S., with Oil, 1 in 500. Not in Fr. or Norw.

Not Official.

OLEUM FŒNICULI.—A colourless or slightly yellow liquid, possessing a peculiar characteristic odour and taste. It is distilled from Fennel Fruit, the yield of Oil varying from 4 p.c. to 6 p.c.

The important constituent of this Oil is Anethol. It also contains the ketone, Fenchone, which is isomeric and closely related to Camphor.

The commoner oils contain the Terpenes, Dextro-pinene and Dipentene, together with Phellandrene and Limonene. A good oil contains about 60 p.c. Anethol.

The Oil from Japanese Fennel resembles closely that from the other varieties. —*P.J.* '96, ii. 91; *C.D.* '96, ii. 191.

Commercial varieties of Fennel and their essential oils.—*P.J.* '97, i. 225.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Ger., Hung., Jap., Norw., Port., Russ., Swed., Swiss and U.S. Not in Fr., Ital. or Mex.

Tests.—Fennel Oil has a specific gravity of 0·965 to 0·980. It is soluble in an equal volume of Alcohol (90 p.c.) and 1 in 10 of Alcohol (80 p.c.). It is dextrogyrate, the rotation being from + 12° to + 20° in a 100 mm. tube. The solidifying point should be between 5° and 10° C. (41° and 50° F.).

The more generally occurring adulterations of Fennel Oil are oils from which the Stearoptene has been removed, Alcohol, Volatile Oils containing Phenols, and Oil of Turpentine. The addition of oils from which the Anethol has been abstracted is rendered evident by the lowering of the solidifying point, Alcohol by the lowering of the specific gravity, whilst Turpentine is also detected by the reduction in the specific gravity, the Alcohol-solubility and Rotation.

Ferric Chloride T.S. is employed to detect volatile oils containing Phenol, the addition of a drop of the solution to an alcoholic solution of the Oil should produce no coloration.

Not Official.

FORMIC ALDEHYDE.

METHANAL. METHYL ALDEHYDE.

Produced by the limited oxidation of Methyl Alcohol. A gas condensable by cold to a clear mobile liquid. The commercial article '**Formol**' or '**Formalin**' is stated to be a 40 p.c. solution.

The Formaldehyde Solution official in the *U.S.P.* is required to contain not less than 37 p.c. w/w, that of the *P.G.* about 35 p.c. w/w, and that of *Fr. Codex*, 35 p.c. w/w. of absolute Formaldehyde.

FORMALDEHYDUM SOLUTUM.—A clear colourless fluid, with an irritating odour, containing from 35 to 40 p.c. of Formaldehyde.

Medicinal Properties.—The strong solution (35 to 40 p.c.) is a powerful antiseptic, disinfectant and deodorant; it is also a powerful caustic, and should be handled with care. The vapour is irritating to the eyes and nose, probably due to traces of Formic Acid. Even in very dilute solution, 1 of Formic Aldehyde in 20,000, or 1 of Formalin in 8000, it possesses considerable antiseptic power, and will preserve liquids otherwise liable to change. The 35 p.c. solution diluted with 50 to 100 of Water, may be used as a general antiseptic in the sick room for washing the hands, spray, etc., and with 400 to 500 of Water as an antiseptic mouth-wash or gargle.

Case of poisoning by drinking 4 oz. of a 4 p.c. solution.—*P.J.* '99, ii. 295.

Formalin (40 p.c.) in 2000 to 3000 of Water used freely to hypopyon ulcers, and septic abrasions of the cornea.—*B.M.J.* '96, i. 144.

2 p.c. solution in ringworm.—*B.M.J.E.* '94, ii. 103; *Y.B.T.* '95, 394.

40 p.c. solution applied to ringworm.—*B.M.J.* '96, ii. 650.

40 p.c. solution sometimes causes suppuration, and is not so useful for ringworm as Carbolic Acid.—*B.M.J.* '97, i. 972.

Stated to be best administered with Sugar of Milk, without a single bad result (*M.P.* '04, ii. 523) in many hundred cases, including scarlet fever, diphtheria, erysipelas and cystitis.

Formic Aldehyde has received considerable attention as a therapeutic agent in pulmonary tuberculosis, and has been employed both intravenously and as an inhalation. Maguire in his Harveian lectures recommends a solution of 1 part Formic Aldehyde Gas in 2000 parts of a sterilised solution of Sodium Chloride.—*Trans. of Brit. Cong. on Tuberculosis*, vol. iii. p. 438; *L.* '00, ii. 1549, 1633, 1709; '01, i. 629, 707; '01, ii. 310; '03, i. 98; '03, ii. 463; *B.M.J.* '00, ii. 1566, 1637, 1695.

Intravascular antisepsis.—Experiments show that at present there is no evidence which would warrant that the course of a septicæmia in animals can be favourably influenced by the intravenous injection of an antiseptic.—*L.* '03, i. 98.

A single intravenous injection of Formaldehyde in physiological solution effected a cure (*L.* '05, i. 1341) in a case of marked oral sepsis, and the cure by intravenous injection in a case of tuberculous abscess of the lung in a patient with acute pulmonary tuberculosis was absolute and rapid. Tubercle bacilli, sputum and cough all disappeared.

Poisons such as Strychnine, Veratrine, Morphine, Atropine and Phosphorus will remain in the organs preserved with a 10 p.c. aqueous solution of Formalin for a very long time.—*L.* '05, i. 1093.

Formaldehyde has been somewhat extensively used by intravenous injection in the treatment of pulmonary phthisis, and a solution of 1 in 2000 is a suitable strength for injection.

As an inhalation, it has been used with good results in tuberculosis, pertussis and diphtheria. 2½ to 6 p.c. solutions of Formalin in pure Water or in 10 to 20 p.c. Glycerin solution are convenient, and should there be more than usual sensitiveness in the air-passages, a little Aromatic Spirit of Ammonia may be added.

A solution of Formalin 1, Chloroform 1, Alcohol (90 p.c.) 2, has also been used; or it may be used as a fine **spray** at a strength of 6 to 10 p.c. solution mixed with Glycerin.—*B.M.J.* '99, i. 202, 772, 1440; '00, i. 139; '00, ii. 1624; '02, ii. 1692; *L.* '01, i. 468; '01, ii. 310; '02, ii. 562, 772; *Trans. of the Brit. Cong. on Tuberculosis*, vol. iii. p. 436.

Severe inflammation of the ends of all the finger nails caused by the prolonged use of a 1 in 500 solution of Formalin as a disinfectant for the hands.—*B.M.J.* '02, i. 54.

Recurrent papillomata of the larynx treated locally by Formalin as a 1 in 1000 increasing up to 1 in 100 spray.—*L.* '01, ii. 487.

A solution of equal parts of Formalin and Glycerin as a paint in lupus.—*B.M.J.* '01, i. 1078; *B.M.J.E.* '01, ii. 48.

10 to 50 p.c. ointment in chilblains if skin be not delicate.—*Pr.* '08, i. 251.

Cases of poisoning from swallowing commercial Formalin.—*B.M.J.E.* '01, i. 9, 72.

A few drops of Liquor Ammoniæ Fort. well diluted with Water, or still better Liquor Ammonii Acetatis, given at frequent intervals as an antidote in cases of Formalin poisoning.—*B.M.J.E.* '01, ii. 7.

Formic Aldehyde as a preservative of foods.—It is generally condemned as a preservative of foods on account of its action on the flesh-forming constituents, rendering them insoluble. The proteids of Milk containing Formalin fail to yield to the digestive action of Pepsin.—*L.* '99, i. 1507; '99, ii. 1282, 1427, 1577; '00, i. 228; *J.C.S. Abs.* '01, ii. 517; *B.M.J.E.* '02, i. 16.

Recommendation of the Departmental Committee appointed to inquire into the use of preservatives in food; that Formaldehyde or any of its preparations be absolutely prohibited in food or drinks.—*L.* '01, ii. 1683; *B.M.J.* '01, ii. 1758; *P.J.* '01, ii. 620; *C.D.* '01, i. 880; *Analyst*, '01, 333.

Formic Aldehyde as a disinfectant.—There is no conflict of evidence as to Formaldehyde being a reliable disinfectant when used in solution, or used in the gaseous state for room disinfection when all objects are freely exposed, but it seems to be the general opinion that for the disinfection of heavy materials and furniture, or where there are many cracks or fissures, or the surfaces are not freely exposed, on account of its non-penetrative properties it is not so suitable as Sulphurous Acid Gas. It has the advantage, however, of being non-injurious to delicate fabrics such as furs, silks, etc.—*L.* '99, i. 1436; '02, i. 759; '03, i. 37; *B.M.J.* '99, i. 1280; '00, i. 1575; '00, ii. 1600; '02, i. 792; *B.M.J.E.* '00, i. 55; *T.G.* '99, 600.

Report of the practical experiments on disinfectants undertaken by the London County Council: both Formic Aldehyde and Sulphur Dioxide failed in the case of wood and cloth charged with spores; in the case of tuberculous sputum dried on linen and paper, Formaldehyde showed to greater advantage than Sulphur Dioxide.—*L.* '02, i. 759; *B.M.J.* '02, i. 792.

Formaldehyde in the state of vapour is able to destroy the bacilli in '*dried*' sputum, but solutions of 4 to 10 p.c. did not affect '*ordinary*' sputum.—*L.* '03, i. 37.

A paper by Kanthack on the use of Formalin lamps for the disinfection of rooms.—*L.* '98, ii. 1049.

The Aldehyde vapours are non-poisonous, but very irritating to the eyes and throat; they possess marked deodorant and disinfectant properties, and are well suited to the purposes of room disinfection, for they do not affect colours. The use of the reagent in a gaseous form appears to possess the advantages over disinfection by Sulphurous Acid, that it injures nothing except Iron, it diffuses better, and it possesses greater disinfectant power.—*B.M.J.* '98, i. 1542.

Muller's Fluid, containing 10 p.c. of Formol, has been recommended for hardening pathological specimens, but it deposits in 5 days and must be changed; 60 p.c. Alcohol, to which 1 p.c. Formol has been added, is a good preservative fluid after hardening in above.—*B.M.J.E.* '96, i. 88.

The 35 p.c. solution is diluted with 10 to 50 of Water, for fixing and hardening histological and pathological specimens, and for preserving them.

In room disinfection, best results obtained when 50 grammes of Potassium Permanganate are added to 100 c.c. Formaldehyde, or multiples of these quantities, depending on the space to be disinfected.—*T.G.* '07, 460.

Value and selection of disinfectants.—*Pr.* '07, 269.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Span., Swed., Swiss and U.S.

Tests.—Formic Aldehyde Solution has a specific gravity of 1·079 to 1·081. The *U.S.P.* has a specific gravity of 1·075 to 1·081 at 25° C. (77° F.); the *P.G.* solution 1·079 to 1·081. It should be neutral or only faintly acid to Litmus paper.

On evaporating 5 c.c. to dryness on a water-bath a white amorphous mass is left, which should leave no weighable residue on ignition.

If the solution be made strongly alkaline with Ammonia Solution and evaporated to dryness on a water-bath, a white crystalline residue readily soluble in Water remains. Formaldehyde Solution readily reduces Silver Ammonio-nitrate Solution, and Potassio-cupric Tartrate Solution, the former yielding a greyish-black deposit of metallic Silver, the latter a deposit of red Cuprous Oxide. 2 c.c. of the Solution mixed with an equal volume of Potassium Hydroxide Solution and about 0·5 gramme of Resorcin gradually yields, when the mixture is heated to boiling, a bright red coloration. 2 drops added to 5 c.c. of Sulphuric Acid containing a little dissolved Salicylic Acid yields, on gently warming, a permanent deep red colour. A brilliant blue colour, varying in intensity with the amount of Formaldehyde present, is produced when about 0·05 gramme of Phenylhydrazine Hydrochloride is added to 1 c.c. of the solution diluted to 5 c.c. with Distilled Water, followed by the addition of 3 drops of a freshly-prepared 5 p.c. Sodium Nitro-prusside Solution, thorough agitation of the liquid, then Sodium Hydroxide Solution drop by drop until an excess has been added. Numerous methods have been proposed for the quantitative determination of Formic Aldehyde. That perhaps most generally used, on account of the ease of manipulation is the Ammonia process, and depends upon its conversion into Hexamethylenetetramine and determination of the amount of Ammonia absorbed. A weighed quantity of 2 grammes of pure neutral Ammonium Chloride is dissolved in 25 c.c. of Water and introduced into a flask provided with a well-fitting stopper. A weighed quantity of 2·5 grammes of the sample is carefully neutralised with Normal Volumetric Potassium Hydroxide Solution and added to the Ammonium Chloride Solution. A measured quantity of 25 c.c. of Normal Volumetric Potassium Hydroxide Solution is then added, the flask securely stoppered and set aside for one hour. A few drops of Rosolic Acid Solution are added, and the excess of Ammonia is titrated with Normal Volumetric Sulphuric Acid Solution, each c.c. of Normal Volumetric Potassium Hydroxide Solution absorbed corresponding to 2 p.c. w/w of Formaldehyde.

The *P.G.* process consists in treating 5 c.c. of the Formic Aldehyde Solution with 20 c.c. of Water and 10 c.c. of Ammonia Solution, allowing the mixture to react for one hour in a well-stoppered flask. A measured quantity of 20 c.c. of Normal Volumetric Hydrochloric Acid Solution is added, a few drops of Rosolic Acid Solution and the excess of acid titrated with Normal Volumetric Potassium Hydroxide Solution. At least 4 c.c. should be necessary to produce a red coloration. The *U.S.P.* process depends upon the oxidation of the Formic Aldehyde to Formic Acid and titration with standard alkali. A measured quantity of 3 c.c. of Formic Aldehyde Solution is placed in a well-stoppered Erlenmeyer flask and accurately weighed. A measured quantity of 50 c.c. of Normal Volumetric Sodium Hydroxide Solution is added, followed immediately by 50 c.c. of Hydrogen Dioxide Solution added slowly through a small funnel, a drop or two of Litmus Solution having been previously added, and the solution previously neutralised with Normal Volumetric Sodium Hydroxide Solution. When the reaction is completed the funnel and sides of the vessel are rinsed with Distilled Water, the whole allowed to stand 30 minutes, and titrated back with Normal Volumetric Sulphuric Acid Solution, using Litmus Solution as an indicator. The number of c.c. of Normal Volumetric Sulphuric Acid consumed are subtracted from 50, the remainder is multiplied by 2·979 and the product divided by the weight of

Solution taken; the quotient indicates the percentage w/w of absolute Formic Aldehyde. Both methods have been tried in the author's laboratory. The Hydrogen Peroxide method is the more accurate of the two and yields higher results, but the ease of manipulation of the Ammonia process and the fact that the results yielded are sufficiently accurate for most practical purposes ensures its more general application. An Iodometric method has been proposed by G. Romijn (*Analyst* '97, 221). A weighed quantity of 2·075 grammes of Formaldehyde Solution is diluted with Water to 500 c.c. A measured quantity of 10 c.c. of this Solution is mixed with 25 c.c. of Deci-normal Volumetric Iodine Solution and sufficient Sodium Hydroxide Solution (15 p.c.) added drop by drop to colour the liquid clear yellow. Allow to stand 10 minutes and add sufficient dilute Hydrochloric Acid to liberate the uncombined Iodine which is titrated with Deci-normal Volumetric Sodium Thiosulphate Solution. 1 c.c. of the Volumetric Iodine Solution is equivalent to 0·001489 gramme of absolute Formic Aldehyde. A method based on the production of a Bisulphite compound by interaction between Formaldehyde Sodium Bisulphite and Normal Volumetric Sulphuric Acid Solution, using Phenolphthalein Solution as an indicator, has also been suggested. The end reaction is, however, somewhat indefinite, and it is therefore difficult to judge when the reaction is complete. The method adopted by the *Fr. Codex* is similar to that of the *U.S.P.*, and depends upon the oxidation of the Formaldehyde to Formic Acid, by means of Hydrogen Peroxide, and determination of the Formic Acid volumetrically.

The more generally occurring impurities are Methyl Alcohol, excess of acid, *e.g.*, Formic Acid, fixed impurities, Iron, Lead, Copper, and Calcium, Chlorides and Sulphates. The presence of Methyl Alcohol or Acetone may be shown by the Iodoform test, no precipitate of Iodoform should be produced when 1 c.c. of the Solution is mixed with 10 c.c. of Iodine Solution, the excess of Iodine decolorised with Sodium or Potassium Hydroxide Solution, and the mixture warmed; excess of acid may be determined by titration with Normal Volumetric Sodium or Potassium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality, the *U.S.P.* and the *P.G.* permit 0·23 w/v of anhydrous Formic Acid; fixed impurities are detected by the residue left on evaporation and ignition; Iron by the Potassium Ferrocyanide test in the diluted solution; Lead, Copper, Calcium, Chlorides and Sulphates by diluting the solution 1 to 3 or 1 to 4 and applying Hydrogen Sulphide Solution, Ammonium Oxalate Solution, Silver Nitrate Solution or Barium Chloride or Nitrate Solution respectively.

PARAFORMIC ALDEHYDE (Paraform. Tri-oxymethylene).—A white micro-crystalline or amorphous powder, insoluble in Water. It is a polymer of Formic Aldehyde; it volatilises at 100° C. (212° F.), and is readily convertible into that substance when heated to the above temperature in the presence of Water. It is used for disinfecting rooms. It is official in *Fr. Codex*.

Sterilisol.—An aqueous solution of Paraform, the solution being effected at 40° to 45° C. (104° to 113° F.) *in vacuo*.—*L.* '05, i. 1075.

HEXAMETHYLENETETRAMINE.—Colourless and odourless lustrous crystals, or as a white crystalline powder, possessing an alkaline reaction.

It is a condensation product, obtained by the action of Ammonia gas on Formic Aldehyde. It should be preserved in well-stoppered bottles.

Commercial varieties of this substance are known under the names of **Aminoform, Cystamine, Formin** and **Urotropine.**

It has been implied, if not actually stated, that all these products are exactly the same and practically interchangeable. This is not borne out by clinical experience, for the different preparations do not always produce the same results in the same patient. This is precisely what we should expect from a body of which the stereographic formula presents so many different possibilities.

Solubility.—Soluble 5 in 6 of Water, 1 in 8 of Alcohol (90 p.c.), sparingly in Ether.

Urinary antiseptic; given in cystitis and phosphaturia.

Dose.—5 to 15 grains = 0·32 to 1 gramme, dissolved in Water or in aerated Water.

Marvellous effects in doses of 10 grains thrice daily in typhoid bacilluria and cystitis, for which conditions it appears to be an almost specific remedy.—*L.* '00, i. 707, 1059, 1876; '01, i. 174; '02, i. 687; *B.M.J.E.* '02, i. 95. 5-grain doses three times a day in cystitis with ammoniacal urine.—*L.* '00, i. 1653.

As an intestinal disinfectant.—*B.M.J.E.* '01, ii. 60.

In daily doses of 20 to 60 grains in diabetic coma.—*B.M.J.E.* '02, i. 72.

Two cases of hæmaturia following the use of from 5 to 10 grains of the salt three times daily.—*B.M.J.* '01, i. 1473, 1617, 1659; *T.G.* '01, 617.

In the pyuria of tabes dorsalis 3 grains daily.—*L.* '03, ii. 1019.

In vesical catarrh accompanying typhoid fever 10-grain doses have been given three times daily with advantage.—*B.M.J.* '04, ii. 1450. Is stated (*L.* '05, i. 88) to be liable to produce irritation of the stomach, diarrhœa, abdominal pain, a measles-like rash, renal irritation, albuminuria, and strangury. It may cause hæmaturia unless well diluted, and the powder should be taken in at least 5 oz. of Water.

In enteric fever, doubtful if it had any influence on the course of the illness itself.—*B.M.J.* '05, i. 414.

In acute but not in tubercular cystitis, in ½-gramme doses.—*T.G.* '07, 311.

A mixture of Urotropine and Iridin has a pronounced effect in causing dissolution of calculi in the treatment of artificially-produced cholelithiasis. —*B.M.J.* '05, ii. 272.

Of value as a prophylactic against the nephritis of scarlatina; suggested that all cases of scarlatina be treated from the beginning with 5 to 7½ grain doses thrice daily, well diluted with Water, to be continued to the 28th day of the disease.—*Edin. Med. Jour.* '07, i. 113.

Foreign Pharmacopœias.—Official in Dan., Jap., Swiss and U.S.

Tests.—Hexamethylenetetramine sublimes at a temperature of 263° C. (505·4° F.). When mixed with a little Salicylic Acid and heated with Sulphuric Acid, it develops a carmine-red coloration. If heated with diluted Sulphuric Acid the characteristic irritating odour of Formaldehyde is evolved, and if a piece of filter paper, moistened with Silver Ammonio-nitrate Solution, be held over the tube, it is immediately darkened. If this Sulphuric Acid Solution be cooled and supersaturated with Sodium Hydroxide Solution, the characteristic odour of Ammonia is evolved; recognised also by its turning a piece of moistened red Litmus paper blue. A 10 p.c. aqueous solution affords a precipitate with Tannic Acid Solution; with Mercuric Chloride Solution, on standing, crystalline needles are produced; with Iodo-potassium Iodide Solution it yields a brown crystalline precipitate.

The more generally occurring impurities are mineral matter, Copper, Iron or Lead, Chlorides or Sulphates, Ammonia salts, and Paraformaldehyde. Mineral matter may be detected by the residue left on ignition; Copper and Lead may be detected by Hydrogen Sulphide Solution; Iron by Potassium Ferrocyanide Solution; Chlorides by Silver Nitrate Solution after acidification with dilute Nitric Acid; Sulphates by Barium Chloride Solution after acidification with diluted Hydrochloric Acid. Ammonium salts and Paraformaldehyde may be detected by Potassio-mercuric Iodide (Nessler's) Solution, the former causing brownish-red colour or precipitate, the latter readily causing a separation of metallic Mercury.

AMYLOFORM.—A white, amorphous, odourless powder, which is a compound of Formaldehyde with Starch. Insoluble in Water, but when brought in contact with moist surfaces it is slowly decomposed, giving off Formaldehyde. Recommended as a dressing or as a dusting powder.—*L.* '97, ii. 40; '00, i. 470; *T.G.* '00, 316.

Dextroform is a white powder, freely soluble in Water, slightly soluble in cold Glycerin, but dissolves 1 in 10 when warmed. It is a compound of Formaldehyde with Dextrine. It has been used internally, and has been given in the form of a 5, 10, or even 20 p.c. solution in gonorrhœa.

Glutol is a yellowish-white powder, insoluble in Water and Glycerin; it is a compound of Formaldehyde with Gelatin, used as an antiseptic dressing.

FORMICIN.—A syrupy liquid, sp. gr. 1·240 to 1·260. Miscible with Water, Alcohol and Chloroform in all proportions. It is produced by the action of Acetamide on Formaldehyde, and has been introduced (*B.M.J.E.* '05, ii. 99; *P.J.* '05, ii. 835) as a powerful antiseptic. Applied in the form of a 2 p.c. tepid solution it has been used as a surgical disinfectant.

HELMITOL (Hexamethylenetetramine Anhydromethylene Citrate).—Colourless crystals, or as a white crystalline powder, soluble 1 in 5 of Water; sparingly soluble in Alcohol (90 p.c.); insoluble in Ether. Has been recommended in chronic posterior urethritis, cystitis and prostatitis.

In acute cystitis the subjective results were good (*B.M.J.E.* '05, ii. 20), but the cystitis reappeared if the drug were discontinued. It is more useful in bacteriuria, the results being permanent.

Dose.—10 to 15 grains = 0·65 to 1 gramme, three times daily.

HETRALIN (Dioxybenzolhexamethylenetetramine).—One of the many derivatives of Hexamethylenetetramine; it forms snow-white crystals, soluble (according to our experiments, *P.J.* [4], xx. 784; *C.D.* '05, i. 783) 1 in 9 of Water; 1 in 17½ of Alcohol (90 p.c.); 1 in 180 of Ether, sp. gr. 0·735; insoluble in Chloroform. It has been introduced as a urinary antiseptic (*B.M.J.* '04, ii. 1468), but (*B.M.J.E.* '04, ii. 64) failed to produce any good effect in seven cases of tuberculous disease of kidneys and bladder.

In doses of 1 grain, given every 3 hours, has been found of value in acute cystitis in an infant.—*B.M.J.* '07, i. 1181.

In cases of cystitis it has proved beneficial in doses of 15 grains twice a day in a tumblerful of cold Water.—*General Practitioner*, Feb. 18, 1907.

INDOFORM.—A white powder, m.p. 108° to 109° C. (226·4° to 228·2° F.), produced by action of Formaldehyde on Acetyl-salicylic Acid. Sparingly soluble in cold Water, and has an acid, astringent taste. Antirheumatic and antineuralgic.

Dose.—7½ grains = 0·5 gramme.

SODIUM ANHYDROMETHYLENECITRATE (Citarin).—A white granular, amorphous powder, soluble 1 in 1½ Water; insoluble in Alcohol (90 p.c.), and in Ether. Given in rheumatism and gout, and as a solvent for Uric Acid calculi.

Dose.—15 to 30 grains = 1 to 2 grammes.

URESIN (Hexamethylenetetramine Di-lithium Citrate).—A white, crystalline powder, readily soluble in Water; has been given in gout, and as a solvent for certain urinary deposits.

Dose.—5 grains = 0·32 gramme.

Chinotropine (Quinotropine) is a white powder, readily soluble in Water. It is a combination of Quinic Acid and Hexamethylenetetramine. Is said to lessen formation of Uric Acid.—*B.M.J.E.* '01, ii. 95; *P.J.* '01, i. 666.

Dose.—10 to 15 grains = 0·65 to 1 gramme.

Under the name of **Igazol** a combination of Formic Aldehyde with Chloral, Terpene and Iodoform has been introduced for the treatment of pulmonary consumption, and is used as an inhalation.—*Trans. of Brit. Cong. on Tuberculosis*, iii. 416; *B.M.J.* '00, ii. 662.

Lysoform is a clear, colourless or pale yellowish, soapy liquid. Miscible with Water. Introduced as an antiseptic. A solution 1 to 2 tablespoonfuls to the pint is used to disinfect the hands.—*B.M.J.E.* '01, ii. 88; *L.* '03, ii. 1307.

In the sterilisation of the hands, a 2 p.c. solution in Alcohol gave much superior results to the hot Water-Alcohol method (*B.M.J.* '05, i. 727), but still better results were obtained with Bacillol and Sublamin. Bacillol is a Cresol preparation, non-toxic and non-injurious to the hands. Experiments with a 1 p.c. alcoholic solution gave complete sterility through all tests in a minimum of 60 p.c.

Carbol Lysoform is stated to be a mixture of crude Carbolic Acid and Lysoform, and to be a more active bactericide than either of its components.—*B.M.J.E.* '02, ii. 92; *P.J.* '03, i. 340.

Not Official.

FUCUS VESICULOSUS.

Bladder-wrack collected from rocks by the seaside and dried.

Medicinal Properties.—Given to reduce obesity.
Smelling fresh seaweed is said to relieve hay asthma.

Foreign Pharmacopœias.—Official in Mex. (Encina de Mar); Port. (Bodelha). Not in the others.

Descriptive Notes.—This seaweed is of a blackish colour, flat, forked, about half an inch broad and a foot or more long. From other British species it is distinguished by having a mid-rib, and oval air bladders in the frond, usually in pairs, one on each side of the mid-rib. When dried it has often a white efflorescence of Mannite on the surface. It is said to be most active if collected in September and dried in the shade.

Tests.—Bladder-wrack leaves about 15 p.c. of ash when ignited with free access of air. Two specimens examined in the author's laboratory showed 15·0 and 15·6 p.c. of ash.

EXTRACTUM FUCI VESICULOSI.—Prepared by percolation with Alcohol (45 p.c.), and evaporation to a stiff extract.—*B.P.C. Formulary* '01, incorporated in the *B.P.C.* under the title **Extractum Fuci.**

Dose.—3 to 10 grains = 0·2 to 0·65 gramme, in pills.

Test.—It leaves about 18 p.c. of ash on ignition.

EXTRACTUM FUCI VESICULOSI LIQUIDUM.—Dissolve 1 of Extract of Fucus Vesiculosus in Alcohol (45 p.c.) to make 5.—*B.P.C. Formulary* '01, incorporated in the *B.P.C.* under the title **Extractum Fuci Liquidum.**

The fluid extract has been given in *Companion* since 1867, and was included in *B.P.C. Formulary* '01.

Dose.—1 to 2 fl. drm. = 3·6 to 7·1 c.c.

Tests.—Liquid Extract of Fucus Vesiculosus has a specific gravity of about 1·044; contains about 8 p.c. w/v of total solids and about 50 p.c. w/v of Absolute Alcohol.

GALBANUM.

GALBANUM.

FR., GALBANUM; GER., GALBANUM; ITAL., GALBANO; SPAN., GALBANO.

A Gum-resin obtained from *Ferula galbaniflua*, Boiss. and Buhse, and probably from other species.

Galbanum contains about 9·5 p.c. of ethereal Oil, 63·5 p.c. of Gum-resin soluble in Alcohol, and 27 p.c. of impurities. The pure Gum-resin contains Umbelliferone Galbaresinotannol Ester, 20 p.c.; Galbaresinotannol, about 50 p.c.; and about 0·25 p.c. of free Umbelliferone, 0·5 to 30 p.c. of ash.

Medicinal Properties.—Internally similar to Asafetida, but less energetic; externally as a plaster in chronic inflammatory swellings.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Official Preparation.—Pilula Galbani Composita.

Not Official.—Emplastrum Galbani and Unguentum Galbani Compositum.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed. and Swiss. Not in Hung. or U.S.

Descriptive Notes.—Galbanum is much scarcer in commerce than formerly. Two principal varieties of the drug are recognised in commerce, which are called respectively Levant and Persian, although both are the products of Persia. The Levant Galbanum, which comes by way of Egypt and Turkey, occurs in two forms: (1) small yellowish-brown tears, yellowish-white and opaque internally, and possessing a musky odour and bitter and somewhat acrid taste, and probably obtained from the stem; (2) a tough, pasty mass, consisting of slices of root with bluish-green, almost translucent, pieces, mixed with yellowish-brown pieces, and also possessing a musky odour, and evidently obtained from the root. Both of these probably come from near Shiraz, *viâ* the Persian Gulf. The Persian Galbanum occurs also in two forms: (1) a turpentiny, sticky mass, having a turpentiny rather than a musky odour, and containing fruit stalks, but no slices of roots; (2) a treacly liquid, of a reddish colour, often containing fruits of the plant. These apparently come from the Demawend mountains in the north of Persia, by way of Astrakhan and Orenburg, and are apparently the produce not of *F. galbaniflua* but another species. African Ammoniacum, the only Gum-resin that at all resembles Galbanum, does not yield Umbelliferone. Persian Galbanum gives a yellowish-red colour with Hydrochloric Acid, whilst the Levant gives different shades of violet. As the former possesses a musky odour, and the latter a turpentiny one, they are probably derived from different species. The *P.G.* directs Galbanum to be dried over quicklime and submitted to a low temperature in order to powder it.

Tests.—Galbanum yields about 50 p.c. of substances soluble in Alcohol (90 p.c.). If a portion is heated to redness in a dry test-tube, the residue, when cooled and boiled with Water, yields a solution which, largely diluted, produces a strong blue fluorescence when rendered alkaline with Ammonia Solution. This test is known as the Umbelliferone test, and remarks upon its application will be found under Ammoniacum. The ash should not exceed 10 p.c. The volatile Acid value is 73·5 to 114·0; the Acid value, 21·2 to 63·5; the total Saponification value, 116·2 to 135·8.

Ammonia.—If finely powdered Galbanum be boiled with fuming Hydrochloric Acid for a quarter of an hour, filtered through a previously moistened filter, and the filtrate carefully saturated with Ammonia Solution, the mixture shows a blue fluorescence in reflected light.—*P.G.*

Residue from Alcohol (90 p.c.).—After completely exhausting 100 parts of Galbanum with boiling Alcohol (90 p.c.), a residue is obtained which, after drying, should amount to at most 50 p.c. of the original mass.—*P.G.*

Ash.—100 parts of Galbanum should yield on incineration not more than 10 parts of ash, *P.G.*

Preparation.

PILULA GALBANI COMPOSITA.—COMPOUND PILL OF GALBANUM. *B.P.Syn.*—COMPOUND PILL OF ASAFETIDA.

Asafetida, 1; Galbanum, 1; Myrrh, 1; Syrup of Glucose, *a.s.* Mix together on a water-bath.

Dose.—4 to 8 grains = 0·26 to 0·52 gramme.

The following modification will be found convenient for dispensing: powder the Myrrh, mix it with the Asafetida and Galbanum melted on a water-bath, allow the mixture to cool, and after chilling it by artificial means reduce it to powder with one-sixth of its weight of Light Magnesium Carbonate. This powder will keep well, and can be made into pills as required with the aid of Alcohol (60 p.c.).

Foreign Pharmacopœias.—Official in Port., similar to Brit. Not in the others.

Not Official.

EMPLASTRUM GALBANI.—Galbanum, 1; Ammoniacum, 1; melt together and strain; then add them to Yellow Beeswax 1, Lead Plaster 8, previously melted together. Mix. (1 in 11)

Was official in *B.P.* 1885, but omitted in *B.P.* 1898; it has been incorporated in the *B.P.C.* using 7 of Lead Plaster instead of 8 so as to make the total 10.

A plaster more or less resembling this is **Official** in all the Foreign Pharmacopœias except Hung. and U.S. Fr. has Emplâtre diachylon gommé. Mex. Emplasto de Galbano Azafranado. Dutch Emplastrum Gummosum.

UNGUENTUM GALBANI COMPOSITUM.—Galbanum Plaster, 4 oz.; Lead Plaster, 4 oz.; White Beeswax, 4 oz.; soft Extract of Opium, 1 drm.; Olive Oil, 20 fl. oz. Melt together.

It is used for boils and carbuncles, and for sore nipples and inflamed breasts.

GALLA.

GALLS.

FR., GALLE D'ALEP; GER., GALLÄPFEL; ITAL., NOCI DI GALLA; SPAN., AGALLA DE ALEPO.

Excrescences on *Quercus infectoria*, Oliv., resulting from punctures and deposited eggs of *Cynips Gallæ tinctoriæ*, Oliv.

This description occurs in *B.P.* and *U.S.P.* *Fr. Codex* gives it as a pathological product due to the puncture of *Cynips Gallæ tinctoriæ*, Oliv., on the young shoots of the oak of the dyers, *Quercus lusitanica*, Lamk., var. *infectoria*, Oliv.

Chiefly from Turkey, Persia and Greece.

Galls contain 60 to 70 p.c. of Gallo-tannic Acid, and 3 to 5 p.c. of Gallic Acid, to which their therapeutic qualities may be attributed.

Solubility.—All the soluble matter of Galls is taken up by forty times their weight of boiling Water, and the residue is tasteless.

Medicinal Properties.—Astringent. Chiefly used locally in form of lotion or injection to suppress hæmorrhage from the gums, nose, etc.; to lessen the discharge from mucous membranes, as in gleet, leucorrhœa, etc.; both Ointments are useful in painful hæmorrhoids.

Dose.—10 to 20 grains = 0·65 to 1·3 gramme.

Incompatibles.—The mineral Acids, Iron and Lead salts, Copper Sulphate, Silver Nitrate, Potassium and Sodium Carbonates and Alkalis, Lime Water, Tartar Emetic, Ipecacuanha and Opium; Infusions of Cinchona, Calumba and Cusparia.

Official Preparations.—Unguentum Gallæ and Unguentum Gallæ cum Opio. Used in the preparation of Acidum Gallicum and Acidum Tannicum.

Not Official.—Decoctum Gallæ, Suppositoria Gallæ, and Tinctura Gallæ.

Foreign Pharmacopœias.—Official in Austr., Dan., Dutch, Fr. (Gallo d'Alep), Ger., Hung., Ital. (Noci di Galla), Jap., Mex. (Agallas de Levante), Norw., Port. (Galha), Russ., Span. (Agalla de Alepo), Swiss and U.S.

Descriptive Notes.—The galls of *Quercus infectoria* are known in commerce as Aleppo galls, and are met with in three varieties, blue, green, and white. The blue-green are considered the best, the dark green second, and the white galls are of very inferior quality. The last named, besides the pale yellowish-brown colour, are noticeable for the fact that each shows a perforation whence the gall insect has escaped. They are also lighter in weight, and are excluded from use by the official description, according to which Aleppo galls are spherical, averaging ½ to ¾ in. (12 to 18 mm.) in diameter, and have a smooth surface, are dark green or olive green externally, are furnished in the upper half with small pointed tubercles, and ridges widely separated, the lower half, being usually smooth; are yellowish or brownish white internally, with a small central cavity. They have an astringent and slightly acid taste, followed by a slight sweetness. The characteristic features of powdered galls are the raphides, angular fragments of Tannin, the parenchymatous cells, with intercellular spaces, the sclerenchymatous cells with stratified walls, and starch grains with a stellate hilum. English oak galls, from *Quercus pedunculata*, Willd., resemble Aleppo galls in size, but have no prominences, and contain less than a third of the amount of Gallo-tannic acid (15 to 20 p.c.) contained in the Aleppo galls (70 p.c.). Other oak galls, under the name of Morea galls, are occasionally imported from Greece. These are about ⅓ in. in diameter, and have a crown of small tubercles. The Japanese and Chinese galls, from Hiogo and Canton, which are largely imported, are irregularly fig-shaped, hollow, and downy externally, from 1 to 2 in. long, ¾ to 1 in. broad, the shell being only $\frac{1}{16}$ to $\frac{1}{12}$ in. in thickness. They are formed on *Rhus semialata*, Murr., and other species by *Aphis chinensis*, Bell., the skeletons of which are usually found within the galls. They yield up to 78 p.c. of Gallo-tannic Acid, and are therefore of considerable technical value. The plum-shaped Chinese galls are formed on *Distylium racemosum*, S. et Z., Tamarisk galls, formed on *Tamarix orientalis*, L., and other species, are from the size of a pea up to ½ in. in diameter, and are occasionally imported; they contain about 40 p.c. of Tannin.

ACIDUM GALLICUM.—*See* ACIDUM GALLICUM.

ACIDUM TANNICUM.—*See* ACIDUM TANNICUM.

Preparations.

UNGUENTUM GALLÆ.—GALL OINTMENT.

Galls, 1; Benzoated Lard, 4. (1 in 5)

Foreign Pharmacopœias.—Official in U.S., 1 in 5. Not in the others.

UNGUENTUM GALLÆ CUM OPIO. GALL AND OPIUM OINTMENT.

Opium, 7½ grains; Gall Ointment, 92½ grains. (about 1 in 13)

The ointment might be made direct by mixing 15 grains of Opium and 37 grains of Galls with 148 grains of Benzoated Lard.

Not Official.

DECOCTUM GALLÆ.—Bruised Galls, 2½; Distilled Water, 40; boil to 20, and strain. (1 in 8)

B.P.C. Decoction is 1 in 16.

SUPPOSITORIA GALLÆ.—5 grains powdered Galls and 1 grain Opium in each, with a basis of Cocoanut Stearin.

TINCTURA GALLÆ.—1 of Galls percolated with Alcohol (60 p.c.) to yield 8. (1 in 8)

Dose.—½ to 2 fl. drm. = 1·8 to 7·1 c.c.

B.P.C. Tincture is 1 in 10, also with Alcohol (60 p.c.).

Foreign Pharmacopœias.—Official in Austr., Dan., Dutch, Ger., Hung., Jap., Mex., Norw., Russ., Swiss and U.S., 1 in 5. All by weight, except U.S. Not in the others.

Not Official.

GARCINIA PURPUREA, Roxb.

KOKUM BUTTER TREE.

Grows in the forests of Malabar, the Concans, and other parts of the Madras Peninsula.

The Oil of the seeds (*Kokum Butter*) is obtained by first exposing the seeds for some days to the action of the sun to dry; they are then bruised and boiled in Water; the Oil collects on the surface, and on cooling contracts into a solid cake. It melts at 98° F. (36·6° C.). The seeds yield about 10 p.c. of Oil.

It is used in India in the preparation of ointments, suppositories, etc.

Not Official.

GAULTHERIÆ OLEUM.

OIL OF WINTERGREEN.

Three nearly allied substances are sold as Oil of Wintergreen, and they are all official in U.S.

Oil of Gaultheria (Wintergreen).—A volatile Oil distilled from the leaves of *Gaultheria procumbens*, L., consisting almost entirely of Methyl Salicylate, and nearly identical with Volatile Oil of Betula. A colourless or yellow liquid, with a strong characteristic odour, and a pungent taste.

Official in the *Ind.* and *Col. Add.* for the North American Colonies.

It should be kept in well-closed bottles of a dark amber tint, in a cool atmosphere, and protected as far as possible from the light.

It contains, according to Power and Kleber, about 99 p.c. of Methyl Salicylate, with a small amount of a paraffin, probably Triacontane, an aldehyde or ketone, an apparently secondary Alcohol and an Ester.

Tests.—Oil of Gaultheria has a sp. gr. of 1·175 to 1·185. It is slightly lævogyrate, the optical rotation being not below − 0·25° nor more than − 1° in a 100 mm. tube. It boils at 218° to 221° C. (424·4° to 429·8° F.). It should form a perfectly clear solution at about 20° C. (68° F.) with 5 parts of Alcohol (70 p.c.). It should yield the tests and be free from the impurities mentioned under Methyl Salicylate. It may be distinguished from Oil of Betula by its optical rotation, the latter being optically inactive. Foreign oils or Petroleum, if present, may be determined by the sp. gr.

Volatile Oil of Betula (Sweet Birch).—A volatile Oil obtained by distillation from the bark of *Betula lenta*, L. It is identical with Methyl Salicylate, and nearly identical with Oil of Gaultheria.

It should be kept in well-closed bottles of a dark amber tint, in a cool atmosphere, and protected as far as possible from the light.

It is produced by the action of the ferment Betulase on the glucoside Gaultherin.

According to Power and Kleber, the Oil consists, to the extent of about 99·8 p.c., of Methyl Salicylate, and in its unrectified state of a paraffin, probably Triacontane and an Ester, but does not contain the secondary Alcohol found in Gaultheria Oil.

Tests.—Oil of Sweet Birch has a sp. gr. of 1·180 to 1·187. It is optically inactive. It boils between 218° and 221° C. (424·4° and 429·8° F.). It should form a perfectly clear solution at about 20° C. (68° F.) with 5 parts of Alcohol (70 p.c.).

Foreign Oils or Petroleum, if present, may be detected by a lowering of the sp. gr. In other respects it resembles Oleum Gaultheriæ, and conforms to the tests and should be free from the impurities mentioned under that Oil.

Methyl Salicylas ($CH_3C_7H_5O_3$, eq. 150·92) is produced synthetically. A colourless or slightly yellowish liquid, with a characteristic odour and taste. A large proportion of the Oil in commerce is synthetic Methyl Salicylate, or Artificial Oil of Wintergreen.

It should be kept in well-closed bottles of a dark amber tint, protected as far as possible from the light and in a cool atmosphere.

Solubility.—Readily soluble in Alcohol (90 p.c.), Ether, Chloroform, and Glacial Acetic Acid; only slightly soluble in Water.

Medicinal Properties.—A valuable remedy in acute rheumatism, internally; also externally, applied directly over joints and limbs and covered with oiled silk or gutta-percha tissue, to prevent evaporation; thus applied is specially useful in acute muscular rheumatism; also mixed with equal parts of Olive Oil. Used largely as a flavouring agent in America, more particularly in dentifrices. It is a good antiseptic.

Methyl Salicylate is better for external application than the Oil of Wintergreen as it does not produce an eruption. In all cases it was applied according to the process, become classic, of 50 to 100 drops poured upon a double fold of aseptic gauze, and covered by an impermeable material, applied for some hours, either to the forearm or to the leg, and renewed twice every twenty-four hours. The part treated with natural essence of Wintergreen, was more or less red, painful, and covered sometimes with a rubeoliform eruption; pure Methyl Salicylate produced no such reaction.—*L.* '98, i. 52; *B.M.J.E.* '00, i. 56.

As a dressing in the treatment of chorea, 6 to 10 grammes of the Oil either pure or mixed with Vaseline and covered with oiled silk to prevent evaporation.—*T.G.* '99, 240; *B.M.J.E.* '99, i. 8.

In subacute and chronic rheumatism it is stated to be of great advantage, employed either alone or in conjunction with Sodium Salicylate.—*T.G.* '99, 612; *B.M.J.E.* '99, i. 63.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c. every four hours, when given as a substitute for Sodium Salicylate, but the taste is rather pungent.

Prescribing Notes.—*When required to be made into an emulsion or pills, the same general rules would apply as for other Essential Oils, see 'Mucilago Acaciæ' and 'Pilulæ,' or it may be given in Capsules, containing* 5 *or* 10 *minims in each.*

Foreign Pharmacopœias.—Official in Fr. and U.S. Not in the others.

Tests.—Methyl Salicylate has a sp. gr. of 1·185 to 1·190. It is optically inactive. It has a boiling point of 219° to 221° C. (426·2° to 429·8° F.). It is readily soluble in Alcohol (90 p.c.), the solution being neutral or only slightly acid to Litmus paper. *Fr. Codex* gives the sp. gr. as 1·1819 at 16° C. (60·8° F.), and the boiling point as 224° C. (435·2° F.).

The saturated aqueous solution yields with Ferric Chloride T.S. a deep violet coloration. It should form a perfectly clear solution at about 20° C. (68° F.) with 5 parts of Alcohol (70 p.c.). If the Oil be saponified with Sodium Hydroxide Solution and the alkaline liquid be diluted with about three times its volume of Water, and acidified with diluted Sulphuric Acid, a white crystalline precipitate is formed, which, collected on a filter, washed with a little Water and recrystallised from hot Water, should possess a melting point of 156° to 157° C. (312·8° to 314·6° F.) and should otherwise answer the tests of identity and be free from the impurities mentioned under Acidum Salicylicum. It may be determined volumetrically with Normal Volumetric Potassium Hydroxide Solution, using Phenolphthalein Solution as an indicator. A weighed quantity of 5 grammes of the Oil is dissolved in 25 c.c. of the Normal Volumetric Solution and the mixture is boiled for five minutes to effect saponification. It is cooled, and the excess of alkali is titrated with Normal Volumetric Sulphuric Acid Solution. 1 c.c. of Normal Volumetric Potassium Hydroxide Solution corresponds to 0·15092 gramme of Methyl Salicylate. The number of c.c. of Normal Solution absorbed multiplied by 0·15092 and the product multiplied by 20, yields the percentage w/w of absolute Methyl Salicylate present in the sample. The percentage of Methyl Salicylate may also be determined by saponification with Normal Volumetric Potassium Hydroxide Solution, adding sufficient Normal Volumetric Hydrochloric Acid Solution to produce a faintly acid reaction, removing the liberated Salicylic Acid by Ether, washing till free from mineral acid and titrating the ethereal solution of Salicylic Acid with Normal Volumetric Potassium Hydroxide Solution, using Phenolphthalein Solution as an indicator; 1 c.c. of Normal Volumetric Potassium Hydroxide Solution corresponds to 0·15092 gramme of absolute Methyl Salicylate. A good specimen contains not less than 99 p.c. w/w of Methyl Salicylate.

The more generally occurring impurities are Alcohol or Chloroform, other volatile oils or Petroleum, and Methyl Benzoate. Alcohol or Chloroform may be detected by placing the specimen in a flask provided with a suitable condenser and heating on a water-bath, the distillate should not have the characters of Alcohol or Chloroform. The presence of volatile oils or Petroleum is indicated by the separation of oily drops either on the surface or at the bottom of the liquid, when 1 c.c. of Methyl Salicylate contained in a capacious test-tube is agitated with 5 c.c. of Potassium Hydroxide Solution. Methyl Benzoate is indicated by the m.p. of the acid, obtained after saponification and the decomposition of the Salicylate as described above.

SPIRITUS GAULTHERIÆ.—Oil of Gaultheria, 5; Alcohol (95 p.c.), 95; both by measure.—*U.S.P.*

Average Dose.—30 minims. This has been incorporated in the *B.P.C.* using Alcohol *B.P.* in place of Alcohol *U.S.P.*

SANOFORM (Di-iodomethylsalicylate).—A white crystalline powder, almost odourless and tasteless. It contains 62·7 p.c. of Iodine.

The m.p. of the powder is 110·5° C. (230·9° F.), and it therefore may be sterilised at 100° C. (212° F.) without decomposition. It may be employed (*B.M.J.E.* '05, i. 80) in all cases where Iodoform is used, chiefly as a dressing in minor surgical operations, in cases of senile and diabetic gangrene and in gynæcology.

Solubility.—Insoluble in Water and Glycerin; slightly soluble in cold Alcohol (90 p.c.), and readily in Ether.

MESOTAN (Salicylic Acid Methoxymethylester).—A yellow, oily liquid, possessing a slight aromatic odour. Insoluble in Water, readily soluble in Alcohol (90 p.c.), Ether and Chloroform. It is stated to be readily absorbed by the skin, and to be useful as a local application in all forms of rheumatic and gouty affections. It may be used as a 50 p.c. solution in Olive Oil, or by itself.—*B.M.J.E.* '03, i. 44.

Applied externally as an antirheumatic it is stated (*L.* '04, ii. 1293; *B.M.J.E.* '05, i. 20) to have afforded distinct relief. Is stated (*L.* '05, i. 84) to afford relief in the after-treatment of acute rheumatism, but to be of no service during the fever. Not the slightest effect followed its employment in gonorrhœal rheumatism, and in one case well-marked local irritation followed its use.

There can be little doubt (*B.M.J.* '05, i. 715) of the value of Mesotan in the treatment of rheumatism, but its use requires caution and careful supervision. An embrocation consisting of equal parts of Mesotan and oil very gently applied to the feet and ankles caused a rash in about 10 or 12 days, not only on the parts to which the embrocation had been applied, but also on the arms. It should be painted on where the skin is specially delicate (*M.P.* '05, i. 452), and the skin should be previously dried and not covered with any impervious material afterwards.

Methyl-acetyl-salicylate is a crystalline powder, insoluble in Water, soluble in Alcohol (90 p.c.) and in Chloroform. Has been recommended in rheumatic affections.—*C.D.* '03, ii. 90.

Amyl Salicylas.—A colourless or slightly yellowish liquid, with a characteristic odour and taste. It is not nearly so pungent as Oil of Gaultheria, and therefore has been suggested as a substitute for the latter.

GELATINUM.

GELATIN.

The purified air-dried product of the hydrolysis of certain animal tissues as skin, ligaments and bones by the action of boiling Water.

Commercial Gelatin varies considerably in its gelatinising power, and it is advisable to keep to the same brand to avoid alteration in formulas.

Medicinal Properties.—Hæmostatic. Used for increasing the coagulability of the blood in aneurisms.

A sterilised 1 to 2 p.c. solution in normal saline has been used with considerable success in the treatment of aortic aneurism.—*L.* '02, ii. 169, 558; '03, i. 591, 1810; *B.M.J.* '03, i. 1493: *B.M.J.E.* '02, i. 16, 91; *Pr.* lxvii. 577; *P.J.* '99, ii. 213; *C.D.* '01, ii. 442.

A method of preparing the sterilised solution in flasks, and a description of a suitable apparatus for its use.—*B.M.J.* '01, 1415.

Each flask contains the requisite quantity of sterile Gelatin solution ready for use without further dilution and consequent risk of contamination. 100 c.c. of a 2 p.c. solution are introduced (*L.* '05, i. 1169) into the subcutaneous tissue over an interval of from ten to twelve minutes in order to avoid discomfort and over-distension of the skin. The inner aspect of the thigh is found to be the most convenient place for the injection. Potassium Iodide in 10-grain doses three times a day is given concurrently with the Gelatin injection.

Rectal injection of 250 c.c. of a 5 p.c. sterilised aqueous solution of Gelatin in the treatment of hæmoptysis.—*L.* '03, i. 578.

Six samples of Gelatin examined, and tetanus spores found in four of them.—*L.* '03, i. 579.

Cases of tetanus terminating fatally following the subcutaneous injection of Gelatin solution.—*B.M.J.* '01, ii. 638, 741; *L.* '03, ii. 33; *C.D.* '01, ii. 382.

In melæna neonatorum.—*B.M.J.* '02, i. 28.

Contra-indicated in nephritis.—*B.M.J.E.* '00, ii. 71.

In hæmoptysis as a rectal injection, ½ pint (*B.M.J.* '05, i. 68) three times daily.

Following frequent references to the use in aneurism of a 2 p.c. solution in normal saline injected into the gluteal region, a further note appears. A popliteal aneurism was cured by seven injections, into the gluteal region, of a serum containing 2 p.c. of Gelatin. Each dose was 200 grammes, and the injections extended over seven months.—*L.* '05, i. 1169.

Preferable to begin with 50 c.c. of 2 p.c. solution and gradually to increase the quantity to 100 c.c. and the strength to 4 p.c. Treatment to continue over three to six months.—*B.M.J.E.* '06, ii. 76.

Official Preparations.—Used in the preparation of the various Lamellæ, and Suppositoria Glycerini, p. 569.

Not Official.—Gelatin Basis for Pessaries and Suppositories, Glyco-gelatin, Gelato-glycerin and Gelatinum Glycerinatum.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Jap., Mex., Port., Russ., Span., Swed., Swiss and U.S. Not in the others. Fr. has Gelatine, and Gelatine officinale. Swed. includes a white and an ordinary Gelatin.

Tests.—Gelatin, when immersed in cold Water, swells up and softens, taking up from 5 to 10 times its weight of Water, without undergoing solution to any appreciable extent. It dissolves readily in hot Water. It is officially stated to form, in 50 parts of the latter liquid, a solution which is inodorous and which solidifies to a jelly on cooling. The *U S.P.* states also that a solution 1 in 50 of boiling Water should solidify on cooling and form a transparent jelly; the *P.G.* states that a 1 in 100 solution will form a jelly on cooling. A useful test for comparing the gelatinising power of commercial Gelatins is to place 5 grains in a test-tube (¾ in. in diameter) with 250 grains of Water for half an hour, warm gently until dissolved, then place the test-tube in Water at 15·5° C. (60° F.), and leave it undisturbed for 30 minutes, by which time a jelly should be formed of such consistence that it will remain in position if the test-tube be inverted. The aqueous solution affords a whitish precipitate with Tannic Acid Solution; *U.S.P.* specifies the strength of Solution as 1 in 5000, the *P.G.* says 'very dilute solutions.' Mercuric Chloride also affords a precipitate in an aqueous solution; neither Ferric Chloride T.S., Lead Acetate Solution, nor Alum Solution produces a precipitate. Potassium Bichromate Solution added to a Solution of Gelatin in hot Water, forms, *on cooling*, a jelly, which becomes insoluble in warm Water after exposure to light. This latter reaction is made use of in photo-lithography. The *U.S.P.* and *P.G.* require that when incinerated it shall not leave more than 2 p.c. of ash.

Not Official.

GELATIN BASIS FOR PESSARIES AND SUPPOSITORIES.—Soften 1 oz. of Gelatin by allowing it to soak in 1 fl. oz. of Water until it is absorbed, then dissolve in 3½ fl. oz. of Glycerin by the heat of a water-bath and allow it to cool and solidify. It can be medicated by melting it over a water-bath and suspending or dissolving in it substances in fine powder, and then pouring the mixture into moulds.

See also Glycerin.

GLYCO-GELATIN.—Refined Gelatin, 1 oz.; Glycerin (by weight), 2½ oz.; Ammoniacal Solution of Carmine, a sufficiency; Orange-flower Water, 2½ fl. oz.—*Throat.*

Soak the Gelatin in the Water for 2 hours, then heat in a water-bath till dissolved; add the Glycerin and stir well together. Let the mixture cool, and when nearly cold add the Carmine solution; mix till uniformly coloured, and set aside to solidify.

This mass is used for making the various medicated **Pastils**; the various substances are rubbed with an equal quantity of Glycerin, and added to the mass when melted over a water-bath.

Glyco-gelatinum.—Gelatin, 12; Glycerin, 40; Distilled Water, 20; Orange-flower Water, 20; Sugar, 5; Citric Acid, 2; Oil of Lemon, 0·10; Solution of Carmine, a sufficient quantity.—*B.P.C.*

This mass is stated to be of an unsatisfactory consistence; the following is an improvement (*P.J.* '07, ii. 804, 813):—

Gelatin, 20; Glycerin, 30; Distilled Water, 56; Orange-flower Water (undiluted), 7; Citric Acid, 2·50; Absolute Alcohol, 1; Oil of Lemon, 0·20; Solution of Carmine, 1.

GELATO-GLYCERIN.—Refined Gelatin (by weight), 5 oz.; Glycerin (by weight), 6 oz.; Water (by weight), 6 oz. Soak the Gelatin in the Water for 12 hours, with occasional stirring, add the Glycerin, dissolve in a water-bath, and evaporate to produce 15 oz. by weight of the Gelato-glycerin.—*Throat.*

(For preparing Nasal Bougies.)

This has been incorporated in the *B.P.C.*

GELATINUM GLYCERINATUM.—Gelatin, 1; Glycerin, 1; Water, quantity sufficient to make 2 (all by weight).—*U.S.P.*

Cover the Gelatin with boiled and Distilled Water, and after one hour drain the excess of Water away; transfer to a tared dish, add the Glycerin, and heat on a water-bath until solution is effected; strain whilst hot, and evaporate to 2.

GELSEMII RADIX.

GELSEMIUM ROOT.

FR., GELSEMIUM; GER., GELSEMIUMWURZEL; ITAL., GELSEMIO; SPAN., GELSEMIO.

The dried Rhizome and Roots of *Gelsemium nitidum*, Michaux.

The plant, Carolina Jasmine, grows in the Southern States of North America.

The root contains two alkaloids: Gelsemine and Gelseminine. It also contains B-methylæsculetin, which is identical with Gelsemic Acid.

Excellent papers on the alkaloidal content of Gelsemium Root and Rhizome appear in *Proc. Amer. Pharm. Assoc.*, liii. 282; liv. 383.

Medicinal Properties.—Antispasmodic and analgesic. Has been used in dental neuralgia, migraine, and especially in tic-douloureux (neuralgia of fifth nerve); also in uterine and ovarian pain, spasmodic and asthmatic cough, and in chorea.

This drug should be used with care, and in the event of toxic symptoms presenting themselves, artificial respiration should be carried on.—*Pr.* li. 50.

Official Preparation.—Tinctura Gelsemii.

Not Official.—Extractum Gelsemii Alcoholicum, Fluidextractum Gelsemii.

Antidotes.—Emetic of Mustard and Water, Atropine, Aromatic Spirit of Ammonia, Brandy, Nitroglycerin, and Digitalis. Artificial respiration should be kept up very steadily for at least three hours.

Foreign Pharmacopœias.—Official in Jap., Mex., Swiss and U.S. Not in the others.

Descriptive Notes.—Gelsemium Root consists mostly of the underground stem or rhizome, with occasional pieces of the root. The rhizome is easily distinguished by the presence of a small, usually dark, pith; it has a purplish-brown longitudinally-fissured bark, which is thin (about 1 mm. *U.S.P.*) and shows when fractured a few silky fibres. The root is yellowish-brown and tortuous, but has no pith; both root and stem have a radiate woody structure with numerous medullary rays; the bark has a bitter taste and a faint, slightly aromatic, odour. The pieces vary in diameter from $\frac{1}{4}$ to $\frac{3}{4}$ of an inch (6 to 18 mm.), and about 6 to 8 inches (20 or even 30 cm.

U.S.P.) in length. According to Sayre, the root contains less of the active principle than the rhizome, but it resides almost entirely in the bark, and the tincture is therefore likely to vary in strength according to the proportion of bark present; it also varies in different samples, and a tincture made from the fresh rhizome is more active as a heart depressant. Under the microscope the structure of the root is remarkable for the thick medullary rays, which are about 6 to 8 cells in thickness, the cell walls being thick and pitted, but as they approach the cortical zone, the cells become larger, thinner walled, and many of the cells contain octahedral prisms of Calcium Oxalate. The cortical parenchyma has no stone cells nor laticiferous vessels; the liber has no lignified fibres; and the numerous vessels in the wood are isolated, not in groups.

Tests.—Although numerous processes have been published from time to time for the assay of the preparations of Gelsemium, very few give accurate or uniform results, and those which yield uniform results are too complicated for ordinary usage. A process which gives very satisfactory and concordant results, and which, when tried in the author's laboratory, was found to justify the claims made for it, is recorded, *Proc. Amer. Pharm. Assoc.* lv. (1907), 357. As carried out on the fluid extract, the details are as follows:—A measured quantity of 15 c.c. is evaporated at 60° C. (140° F.) to a soft extract, or sufficiently to dissipate the Alcohol. A measured quantity of 5 c.c. of Normal Volumetric Sulphuric Acid Solution, which has been previously diluted with an equal volume of Water, is added and the resulting mass allowed to disintegrate, when this is accomplished it is transferred to a 15 c.c. graduated cylinder and diluted to 15 c.c., it is thoroughly mixed, the precipitate allowed to settle and a measured quantity of 10 c.c. is filtered or decanted off into a separator, the acid solution is washed with Chloroform, using three separate portions each of 10 c.c., 5 c.c. and 5 c.c. The chloroformic washings are in each instance separated, mixed and in turn washed with about 5 c.c. of slightly acidulated Water, the acid aqueous washings being mixed with the main acid solution. The mixture is rendered alkaline with Ammonia Solution and the liberated alkaloids are shaken out with three successive quantities each of 15 c.c., 10 c.c. and 5 c.c. of Chloroform. A further quantity of 10 c.c. of Chloroform may occasionally be necessary to extract the whole of the alkaloids, their complete extraction may be determined by allowing a few drops of the chloroformic solution to evaporate, acidifying with dilute Sulphuric Acid and testing with a drop or two of Potassio-mercuric Iodide (Mayer's) Solution. The chloroformic liquids are in each instance separated, mixed, transferred to a tared flask, the Chloroform is evaporated and the residue dried until constant in weight, the weight of alkaloids multiplied by 20 and the product divided by 3 yields the percentage w/v of Chloroform-soluble Gelsemium alkaloids present in the specimen operated upon. The alkaloidal residues remaining from the above process were of a bright yellow colour, and were comparatively pure products. A sample of fluid extract of Gelsemium prepared in the author's laboratory in 1885 by the then official process of the *U.S.P.*, when recently examined gave the following figures: specific gravity, 0·865; total solids, 8·74 p.c. w/v; Absolute Alcohol, 81·11 p.c. w/v; and when assayed according to the process described above yielded 0·37 p.c. w/v of Chloroform-soluble Gelsemium alkaloids.

The following constituents of Gelsemium have been described:

Gelsemin.—A name given to a resinoid and eclectic remedy, resembling the alcoholic extract.

Dose.—½ to 2 grains = 0·032 to 0·13 gramme.

Gelsemine, Gelsemine.—The crystallisable alkaloid forming crystalline salts, described by Gerrard (*P.J.* (3) xiii. 641) as having the formula $C_{24}H_{28}N_2O_4$, eq. 405·24 and the melting point 45° C. (113° F.). Spigel says that experiments intended to establish the formula for Gelsemine (known in Germany as **Gelseminine**) as between $C_{24}H_{28}N_2O_4$ (Gerrard) and $C_{22}H_{26}N_2O_3$ have not led to a decisive conclusion, yet the results of analyses agree more closely with the latter formula.

A brittle transparent solid, crystallising with difficulty from Alcohol. It is only sparingly soluble in Water, more readily in Alcohol (90 p.c.), and readily in Ether and Chloroform. It dissolves in strong Nitric Acid with little or no colour. When the liquid is allowed to evaporate spontaneously in porcelain, a permanent bluish-green colour is obtained. The pure alkaloid dissolves without change of colour in concentrated Sulphuric Acid, even on warming, but if not perfectly pure, a reddish or brownish colour is obtained, which gradually becomes pinkish, and on heating becomes chocolate or purple. When treated with strong Sulphuric Acid and an oxidising agent, *e.g.*, Potassium Bichromate, a fine reddish-purple or cherry-red coloration is produced, rapidly changing to a bluish-green or blue tint.

Dose.—$\frac{1}{120}$ to $\frac{1}{32}$ grain = 0·0005 to 0·002 gramme.

Care must be taken to ascertain the intention of the prescriber when any doubt exists as to whether the alkaloid or resinoid is required.

When quite free from Gelseminine, with which all early specimens were probably mixed, **Gelsemine** is stated (*Pr.* li. 38) to be without action on *mammals*, even when injected intravenously up to ½ gramme = 7½ grains. Gelseminine, on the other hand, is intensely poisonous, causing a descending paralysis of the central nervous system, ½ grain = 0·032 gramme being the calculated lethal dose for an adult. Applied locally it produces dilatation of the pupil, and it is to the action of this alkaloid, modified by the various acid resins, that the action of Gelsemium Tincture is mainly due.

Gelseminæ Hydrochloridum.—Colourless crystals, soluble in Water. Known in Germany as **Gelsemininum Hydrochloricum Cryst.**

Dose.—$\frac{1}{120}$ to $\frac{1}{32}$ grain = 0·0005 to 0·002 gramme.

Gelseminine.—A white amorphous powder, which softens at 105° C. (221° F.), and melts at 120° C. (248° F.) with partial decomposition. Insoluble in Water, soluble in Alcohol (90 p.c.), Ether and in Chloroform. With dilute Nitric Acid it yields a brown coloration, with concentrated Nitric Acid a green coloration, and with Sulphuric Acid a yellow coloration, changing on the addition of an oxidising agent, *e.g.*, Potassium Bichromate, to violet and, finally, green. It is intensely bitter and poisonous.

Gelsemic Acid is not known to have any medicinal properties, but affords reactions, which to some extent serve as a test for Gelsemium preparations, particularly the blue fluorescence which it produces in alkaline solutions.

Colourless, odourless and nearly tasteless groups or tufts of prisms, or in minute scales and plates. It is not distinctly acid to Litmus paper. It is soluble in hot Water, readily soluble in Alcohol (90 p.c.), and in Ether and Chloroform. It dissolves in solutions of the fixed alkalis and in Ammonia

Solution, forming a solution having an intensely yellow colour by transmitted light, but which by reflected light exhibits a strong green fluorescence, which is readily destroyed by free acids. It dissolves in Nitric Acid with the production of a yellow or orange colour, changing, on the addition of an excess of Ammonia Solution, to a blood-red coloration.

Preparation.

TINCTURA GELSEMII. Tincture of Gelsemium.

1 of Gelsemium Root, in No. 40 powder, percolated with Alcohol (60 p.c.) to yield 10. (1 in 10)

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Swiss, maximum single dose, 1 gramme; maximum daily dose, 5 grammes.

Foreign Pharmacopœias.—Official in Mex., 1 in 5; Swiss and U.S., 1 in 10; Jap., 1 in 8. All by weight except U.S. Not in the others.

A girl 9 years old was killed in two hours by 2 fl. drm. = 7·1 c.c. of the Tincture.

Tests.—Tincture of Gelsemium has a sp. gr. of 0·920 to 0·925; it contains about 1·5 p.c. w/v of total solids and about 58 p.c. w/v of Absolute Alcohol. When assayed according to the process described under Gelsemii Radix the *B.P.* Tincture yielded 0·043 p.c. w/v of Chloroform-soluble Gelsemium alkaloids. A specimen of the *U.S.P.* Tincture prepared and examined in the author's laboratory had a specific gravity of 0·913, it contained 1·8 p.c. w/v of total solids. When assayed according to the process recommended under Gelsemii Radix it yielded 0·048 p.c. w/v of Chloroform-soluble Gelsemium alkaloids.

A standard of 0·025 p.c. w/v of Gelsemine has been suggested for the Tincture, but a standard of total alkaloids is suggested as a safer basis.—*Y.P.B.* '04, 279.

The Rhizome contains from 0·38 to 0·7 p.c. of total alkaloids, so that 0·5 p.c. might be regarded as a suitable standard, equal to 00·5 p.c. of total alkaloids for the Tincture.

The percentage of alkaloids in the Tincture may vary between 00·2 and 0·076 p.c. w/v, but standardisation, according to total alkaloids without the ratio of the two alkaloids, may be of doubtful value.

Not Official.

EXTRACTUM GELSEMII ALCOHOLICUM.—Gelsemium in No. 60 powder percolated with Rectified Spirit and evaporated to an extract.—*B.P.* '85.

Dose.—½ to 2 grains = 0·032 to 0·13 gramme.

This has been incorporated in the *B.P.C.*

FLUIDEXTRACTUM GELSEMII.—Percolate 100 of Gelsemium in No. 60 powder with Alcohol (95 p.c.) until exhausted, reserve the first 90 of percolate and evaporate the remainder to a soft extract, which mix with the reserved portion and make up to 100.—*U.S.P.*

Average dose.—One minim = 0·06 c.c.

This has been incorporated in the *B.P.C.*

GENTIANÆ RADIX.

GENTIAN ROOT.

FR., RACINE DE GENTIANE; GER., ENZIANWURZEL; ITAL., GENZIANA; SPAN., GENCIANA.

The dried Rhizome and Roots of *Gentiana lutea*, L.

Collected in the mountainous districts of central and southern Europe.

The active principle **Gentiopicrin** is a neutral crystalline body, soluble in Water and diluted Alcohol, insoluble in Ether.

Medicinal Properties.—Bitter tonic; used in cases of atonic dyspepsia; the infusion is recommended in the vomiting of pregnancy, along with a mineral acid, or when a general tonic is required, as in convalescence from acute diseases or in nervous debility.

For the ordinary phthisical patient nothing is better in the way of drugs to promote appetite and aid digestion than the time-honoured Mistura Gentianæ Alkalina of the Brompton Hospital Pharmacopœia.—*L.* '04, ii. 1827.

The extract has been largely used as an excipient to form powders into pills.

Official Preparations.—Extractum Gentianæ, Infusum Gentianæ Compositum, and Tinctura Gentianæ Composita.

Not Official.—Extractum Gentianæ, Fluidextractum Gentianæ; Infusum Gentianæ Compositum Concentratum, Aromatic Infusion of Gentian, Mistura Gentianæ, Mistura Gentianæ Alkalina, Mistura Gentianæ cum Soda, Mistura Gentianæ Acida, Tinctura Gentianæ.

Incompatibles.—Ferrous Sulphate, Silver Nitrate, and Lead salts.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital. (Genziana), Jap., Mex. (Genciana), Norw., Port., Russ. Span., Swed., Swiss and U.S.

Descriptive Notes.—The official Gentian Root is that of *Gentiana lutea*. As met with in commerce, Gentian Root consists of more or less rootstock continuous with the root; the rootstock being marked with crowded rings of leaf scars, but the root is longitudinally wrinkled. It varies much in length and thickness; seldom exceeding an inch (2½ cm.) in diameter, *B.P.*; 5 to 35 mm. (⅕ to 1½ inch), *U.S.P.*; Gentian Root is usually somewhat flexible and tough, with a soft fracture showing no woody tissue or medullary rays, but when recently dried is harder and brittle. Externally it is of a yellowish-brown colour, but internally more of an orange tint or reddish-yellow. The reddish colour, which causes it to be distinguished on the Continent as Red Gentian Root, is partly the result of fermentation before the root is dried, by which the characteristic odour is also more developed. The taste is sweet at first, but soon afterwards bitter. There is occasionally met with in English commerce a root with a paler fracture, known as White Gentian, which is disagreeably bitter, and should therefore not be substituted for the Official kind. It is imported from Bordeaux, and is probably derived from *Gentiana Burseri*, Lapeyr., and is not fermented before drying. Under the microscope the tissue is seen to be devoid of sclerenchymatous cells; contains minute Calcium Oxalate crystals, and rarely a few simple starch grains. The wood possesses sieve-tubes besides reticulated vessels, *P.G.* and Jap. The *B.P.* requires that it should not yield any definite reactions with the tests for Starch. It has been found to be adulterated with 20 p.c. of ground olive stones, and a conviction obtained, *P.J.* (4) xxiv. 339. The *P.G.* permits the use of other species besides *G. lutea*, L., including *G. Pannonica*, Scop., *G. purpurea*, L., and *G. punctata*, L. The root of *Gentiana purpurea* has a branched appearance at the apex, due to several stems arising from the crown of one root, but is even more bitter than that of *G. lutea.* The roots of *G. punctata* have a similar appearance, but are a brighter reddish-brown internally. That of *G. Pannonica* is more slender, rarely exceeding 10 mm. in diameter, and has few slender branches. It is likely to occur in root imported from Austria, since it occurs abundantly in the Austrian Alps, where *G. lutea* does not occur.

Tests.—Gentian Root yields about 4 p.c. of ash. Samples examined in the author's laboratory gave from 2·2 to 5·6 p.c., with an average of 3·5 p.c.

Preparations.

EXTRACTUM GENTIANÆ. Extract of Gentian.

An aqueous Extract of Gentian Root; made by maceration with cold Water for 2 hours, boiling for 15 minutes, and evaporation of the strained liquid.

Dose.—2 to 8 grains = 0·13 to 0·52 gramme.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ital., Jap., Mex., Port., Russ., Span., Swed. and U.S., with cold Water; Hung., with hot Water; Ger., Norw. and Swiss, with cold Water, and purified with Alcohol; Dan. and U.S., also **Fluid Extract,** 1 in 1.

INFUSUM GENTIANÆ COMPOSITUM. Compound Infusion of Gentian.

Gentian Root, $\frac{1}{4}$; Dried Bitter-Orange Peel, $\frac{1}{4}$; Fresh Lemon Peel, $\frac{1}{2}$; boiling Distilled Water, 20. Infuse 15 minutes. (1 in 80)

Dose.—$\frac{1}{2}$ to 1 fl. oz. = 14·2 to 28·4 c.c.

Foreign Pharmacopœias.—Official in Fr. (Tisane), Gentian Root 1, cold Water 200; Swed., similar to Brit. Not in the others.

TINCTURA GENTIANÆ COMPOSITA. Compound Tincture of Gentian.

Gentian Root, 2; Dried Bitter-Orange Peel, $\frac{3}{4}$; Cardamom Seeds, $\frac{1}{4}$; macerated with 20 of Alcohol (45 p.c.). (1 in 10)

Dose.—$\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c.

Tests.—Compound Tincture of Gentian has a sp. gr. of 0·965 to 0·970; it contains about 5 p.c. w/v of total solids and about 43 p.c. w/v of Absolute Alcohol.

Foreign Pharmacopœias.—Official in Jap., Mex. and U.S., similar to Brit.; Port., twice as strong as Brit. Not in the others.

Tinctura Gentianæ Composita.—Gentian, 10; Bitter-Orange Peel, 4; Cardamom, 1; Alcohol (95 p.c.), 60 and 40 of Water (mixed). Percolate slowly until exhausted and make up with menstruum to 100.—*U.S.P.*

A simple tincture is official in most Foreign Pharmacopœias, *see* below.

Not Official.

EXTRACTUM GENTIANÆ (*U.S.P.*)—Macerate 100 of Gentian in No. 20 powder with 40 of cold Water for 24 hours, exhaust by percolation with more Water, reduce the liquid to three-fourths of its bulk by boiling, strain; then by means of a water-bath evaporate to a pilular consistence.

FLUIDEXTRACTUM GENTIANÆ (*U.S.P.*).—Exhaust 100 of Gentian in No. 30 powder with Alcohol (49 p.c.), reserve the first 80 of percolate, and evaporate the remainder to a soft extract, which dissolve in the reserved portion, and make up with Alcohol (49 p.c.) to 100.

INFUSUM GENTIANÆ COMPOSITUM CONCENTRATUM.—Gentian Root in No. 10 powder, 10; Dried Bitter-Orange Peel in No. 10 powder, 10; Tincture of Lemon, 10; Tincture of Orange, 5; Alcohol (90 p.c.), 17·5; Dilute Chloroform Water (1 in 1000) sufficient to make 100. Mix the tinctures with the Alcohol, and repercolate the drugs with dilute Chloroform Water, adding the mixed tinctures to the reserved portion.

Dose.—½ to 1 fl. drm.—*Farr* and *Wright*, *P.J.* '06, i. 165 and '07, i. 622; *C.D.* '06, i. 252; *Y.B.P.* '07, 250.

This appears in the *B.P.C.*

MISTURA GENTIANÆ.—Gentian Root, sliced, ¼ oz.; Bitter-Orange Peel cut small, 30 grains; Coriander Fruit, bruised, 30 grains; Proof Spirit, 2 fl. oz. Distilled Water, 8 fl. oz.—*B.P.* '67.

Macerate the ingredients first in the Proof Spirit for two hours, then add the Water, macerate again for two hours, and strain through calico.

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.

Gentian Root, sliced, 2·50; Bitter-Orange Peel, cut small, 0·75; Coriander Fruit, bruised, 0·75; Alcohol (60 p.c.), 20; Distilled Water, 100.—*B.P.C.*

Same directions as above.

Mistura Amaro-alkalina (Gentian Mixture) is official in Dan.

MISTURA GENTIANÆ ALKALINA.—Sodium Bicarbonate, 15 grains; Diluted Hydrocyanic Acid, 3 minims; Aromatic Infusion of Gentian, to 1 fl. oz.—*Brompton.*

Aromatic Infusion of Gentian (*Brompton*).—Gentian, 2 oz.; Lemon Peel, 6 drm.; Orange Peel, 3 drm.; Boiling Water, 1 gallon.

MISTURA GENTIANÆ CUM SODA.—Sodium Bicarbonate, 15 grains; Compound Infusion of Gentian, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

MISTURA GENTIANÆ ACIDA.—Diluted Nitro-hydrochloric Acid, 10 minims; Spirit of Chloroform, 5 minims; Compound Infusion of Gentian, to 1 fl. oz.—*Royal Free.*

Diluted Nitro-Hydrochloric Acid, 10 minims; Spirit of Chloroform, 10 minims; Compound Infusion of Gentian, to 1 fl. oz.—*B.P.C.*

TINCTURA GENTIANÆ (*Ger.*).—Gentian Root, 1; Alcohol (90 p.c.), 5; by weight.

This is also official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Mex., Norw., Port., Russ., Span. and Swiss; 1 in 5. All by weight.

Gentian Root, 1; Alcohol (45 p.c.), 10; by maceration.—(*B.P.C.*).

Not Official.

LIQUID GLUCOSE.

As met with in commerce, it is clear, almost colourless, devoid of smell, and resembles in consistence Canada Balsam. It should be free from Arsenic.

In exhausting diseases, subcutaneous injection of 25 grammes in 24 hours, of a 5 p.c. solution.—*B.M.J.* '02, i. 770.

It forms an excellent excipient for pills, more particularly when diluted with Syrup.

DILUTED GLUCOSE.—Glucose, 3 oz.; Syrup, 1 fl. oz.; mix.
A good excipient for pills.

The following, which is apparently introduced for this purpose, does not answer so well, as it is not sufficiently adhesive.

Official Preparation.

SYRUPUS GLUCOSI. SYRUP OF GLUCOSE.
Liquid Glucose, 1; Syrup, 2. Mix at a gentle heat.

GLUSIDUM.

GLUSIDE.

$C_7H_5NSO_3$, eq. 181·77.

BENZOYL SULPHONIMIDE.

B.P.Syn.—GLUCUSIMIDE.

FR., SACCHARINE; GER., BENZÖESÄURESULFINID; ITAL., SACCARINA; SPAN., SACARINA.

A white crystalline powder, possessing an exceedingly sweet characteristic taste.

Gluside is the anhydride of Ortho-sulphamide-benzoic Acid.

Although the *B.P.* formula $C_6H_4COSO_2NH$ is attached to the synonym Benzoyl sulphonimide, it is not to be inferred that, commercially, Saccharin is sufficiently pure to allow of its representation by this or any other formula.

Commercial Saccharin is not a pure product, but is 'standardised' to 300 times the sweetening power of Cane Sugar, the pure chemical (Saccharin puriss.) to 500 times its weight of Sugar. The proportion of impurity may be estimated by treatment with Acetone, in which the pure salt is completely soluble.

Orthobenzoicsulphinide (commercial Saccharin) is put on the market as a white micro-crystalline powder containing a considerable proportion of Parasulphaminebenzoic Acid.

Commonly known as 'Saccharin.'

The Saccharin Corporation supplies Saccharin of the following strengths:—
330, 450, 500, 550. The last corresponds with Glusidum, *B.P.*

Solubility.—1 in 400 of cold Water; 1 in 28 of boiling Water; 1 in 38 of Alcohol (90 p.c.); 1 in 100 of Ether; 1 in 500 of Chloroform; 1 in 48 of Glycerin.

It is also readily soluble in all alkaline solutions, either of Hydroxide, Carbonate, or Bicarbonate, acting the part of an acid and displacing Carbonic Acid when present. *See* 'Soluble Saccharin.'

Medicinal Properties.—It is used as a substitute for Sugar in diabetes and hepatic diseases and corpulence, and to cover the taste of nauseous drugs. It is eliminated as Gluside in the urine and saliva.

1 grain sweetens 6 to 8 oz. of fluid.

Dose.—$\frac{1}{2}$ to 2 grains = 0·032 to 0·13 gramme.

Not Official.—Saccharinum Solubile, Elixir Glusidi and Tabellæ Saccharini (Saccharin Discs), Sucrol.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch., Fr., Ital., Jap., Norw. (Saccharinum), Mex. (Sacarina), Russ., Span., Swed., Swiss and U. S. (Benzosulphinidum). Not in the others.

Tests.—The m.p. of pure Benzoyl sulphinide is 224° C. (435·2° F.), 223·5° C. (434·3° F.) is given in the *Fr. Codex*. The *B.P.* m.p. for the substance recrystallised from warm Water is between 218° and 219° C. (424·4° and 426·2° F.); the *U.S.P.* gives 219° to 220° C. (426·2° to 428° F.). It possesses an intensely sweet taste, which is perceptible in solutions up to 1 in 100,000 of Water. When moistened with an excess of Potassium Hydroxide Solution, dried, the residue gently fused for several minutes, cooled, dissolved in Water and the solution is faintly acidified with diluted Hydrochloric Acid, it yields with Ferric Chloride T.S. a purple-violet coloration. When fused with a mixture of Potassium and Sodium Carbonates and Potassium Nitrate, the residue dissolved in Water, and the solution filtered, the filtrate yields with Barium Chloride Solution, after acidification with diluted Hydrochloric Acid, a copious white precipitate insoluble in Hydrochloric Acid. 0·01 gramme, heated with an equal weight of Resorcin and a few drops of Sulphuric Acid, yields a mixture at first yellowish-red and then greenish-brown. If the residue is dissolved in cold Water and an excess of Sodium Hydroxide (15 p.c.) added, the mixture assumes a strong green fluorescence. It dissolves with effervescence in warm Sodium Bicarbonate Solution forming 'soluble Gluside' or 'soluble Saccharin,' 100 parts of Gluside yielding nearly 113 parts of neutral 'soluble Gluside.'

The more generally occurring impurities are organic impurities, readily charred by Sulphuric Acid, Glucose, and other reducing Sugars, *e.g.* Milk Sugar, Ammonium salts, Benzoic or Salicylic Acid, and inorganic impurities. The *B.P.* is content with a Sulphuric Acid test for Sugar, and does not include tests, other than the m. p. for any of the remaining impurities. It states that no blackening should occur even when the mixture is gently warmed with Sulphuric Acid. The *U.S.P.* gives the respective quantities of substance and reagent to be employed, the temperature at which the mixture is to be maintained, and the time allowed for the test. Glucose may be detected by Potassium Hydroxide Solution; a test for Milk Sugar and a supplementary test for Glucose is afforded by Potassio-cupric Tartrate (Fehling's) Solution; the substance should not evolve an odour of Ammonia when warmed with Calcined Magnesia and Water; Benzoic or Salicylic Acid are detected in a saturated aqueous solution by the Ferric Chloride test described below, and inorganic impurities by the ash left on ignition, which should amount at the highest to 0·5 p.c.

Alkali Hydroxide and Sodium Bicarbonate.—Gluside is readily soluble in T.S. of Ammonia, *B.P.* and *U.S.P.*; in Alkali Hydroxide solutions, *U.S.P.*; in T.S. of Sodium Bicarbonate with evolution of Carbon Dioxide, *B.P.* and *U.S.P.*

Sulphuric Acid.—If 0·2 gramme of Benzosulphinide be dissolved with agitation in 10 c.c. of pure Sulphuric Acid, and the solution kept at a temperature of from 48° to 50° C. (118·4° to 122·2° F.) on a water-bath, it should not within 10 minutes show a brown colour, *U.S.P.*

Potassium Hydroxide.—The solution of 0·2 gramme in 5 c.c. of T.S. of Potassium Hydroxide should be clear even after prolonged heating, *U.S.P.*

Cupric Tartrate.—A solution of Benzosulphinide in T.S. of Potassium

Hydroxide similar to the above should not, on heating with 5 c.c. of Volumetric Solution of Alkaline Cupric Tartrate, deposit any red Cuprous Oxide, *U.S.P.*

Ferric Chloride.—No precipitate or violet colour should appear when T.S. of Ferric Chloride is added drop by drop to a hot aqueous solution of Benzosulphinide, *U.S.P.*

Not Official.

SACCHARINUM SOLUBILE ('SOLUBLE GLUSIDE').—A soluble Sodium Gluside, containing about 90 p.c. of Gluside. It is much more palatable than ordinary Gluside, which leaves a disagreeable after-taste.

This powder is soluble 1 in 15 of Water.

ELIXIR GLUSIDI. *Syn.* ELIXIR SACCHARINI.—Dissolve 5 of Gluside with 3 of Sodium Bicarbonate in 80 of Distilled Water, add 12½ of Alcohol, filter, and wash the filter with Distilled Water to produce 100.—*B.P.C.*

This is a modification of *B.P.C. Formulary* '01.

Dose.—5 to 20 minims.

TABELLÆ SACCHARINI (SACCHARIN DISCS).—Contain ½ grain = 0·032 gramme Saccharin in each. Should be readily soluble in Water, and should not contain Starch or Sugar.

Sucrol (Dulcin).—Paraphenetol Carbonide is a powerful sweetening agent which occurs in small glistening crystals; it is said to possess about 200 times the sweetening power of Sugar.

GLYCERINUM.

GLYCERIN. GLYCEROL.

FR., GLYCERINE OFFICINALE; GER., GLYCERIN; ITAL., GLICERINA; SPAN., GLYCERINA.

A Trihydric Alcohol, $C_3H_8O_3$, eq. 91·37, containing a small percentage of Water; obtained during the saponification of fats and fixed oils by the action of alkalis, or by their hydrolysis by means of superheated steam.

Glycerin is always produced during the alcoholic fermentation of Sugar to the extent of 3 p.c. of the Sugar employed, and consequently is present in all fermented liquids.

A clear, colourless and odourless thick syrupy hygroscopic liquid, possessing a characteristically sweet taste and producing a sense of warmth in the mouth. It should be kept in well-closed vessels.

Solubility.—Mixes in all proportions with Water and Alcohol, but insoluble in Chloroform, Ether and Oils.

It possesses great powers as a solvent, and is an excellent excipient for many medicinal substances.

Medicinal Properties.—Undiluted it is an irritant, but diluted with aqueous menstrua it is emollient. It is a mild laxative. Internally it is given in irritating cough; it is recommended as a **rectal injection** for constipation, 1 to 2 drm., or the same diluted with an equal quantity of Water produces an evacuation very soon after the injection; also combined with Gelatin or Cocoa-nut Stearin to form a **suppository** for the same purpose; it is very convenient, but may aggravate hæmorrhoids if present.

Externally, a useful addition to lotions and other applications in skin diseases, as pityriasis, eczema, psoriasis, prurigo and lichen.

Used for chilblains and chapped hands, and dryness of the skin or mucous membranes, but it should be diluted with 3 parts of Water for these purposes, or applied in the form of Glycerin of Starch. Used in poultices ($\frac{1}{14}$ or $\frac{1}{16}$) it keeps them soft for a long time.

It is useful in fermentative dyspepsia, when taken in 1 or 2 drm. doses, and does not hinder digestion.—*L.* '80, ii. 6; '96, ii. 25.

Dose.—1 to 2 fl. drm. = 3·6 to 7·1 c.c.

Smaller doses are usually prescribed.

Prescribing Notes.—*It is much employed as a sweetening agent in the place of Syrup, and is better for covering the unpleasant astringent taste of Iron Perchloride; it is largely used in pharmaceutical preparations as a solvent, and, being an antiseptic, it also acts as a preservative. Mixed with equal volumes of Syrup, Alcohol and Mucilage, it forms a good pill excipient. It is too hygroscopic to be used alone.*

Official Preparation.—Suppositoria Glycerini. Used in the preparation of Extractum Cinchonæ Liquidum, Extractum Sarsæ Liquidum, of all the Glycerina and Lamellæ, Linimentum Potasii Iodidi cum Sapone, Liquor Ethyl Nitritis, Liquor Thyrodei, Lotio Hydrargyri Nigra, Mel Boracis, Pilula Ferri, Pilula Quininæ Sulphatis, Syrupus Pruni Virginianæ, Tinctura Kino, Tinctura Rhei Composita, Unguentum Acidi Carbolici, Unguentum Iodi, and Unguentum Suphuris Iodidi.

Not Official.—Dispensing Syrup, Glycerin with Rose Water, Suppositoria Glycerini, Suppositoria Glycerini cum Stearino.

Foreign Pharmacopœias.—Official in Austr., sp. gr. 1·250; Belg., sp. gr. 1·240; Dan., Ger., Hung., Jap., Norw., Russ. and Swed., sp. gr. 1·225 to 1·235; Dutch, sp. gr. 1·230 to 1·235; Fr., sp. gr. 1·264; Ital., sp. gr. 1·226 to 1·260; Mex., Port. and Span., sp. gr. 1·260; Swiss, sp. gr. 1·224 to 1·235; U.S., not less than 1·246 at 25° C. (77° F.).

Tests.—Glycerin has a sp. gr. of 1·260, which figure is given in the *B.P.*; the *U.S.P.* gives not less than 1·246 at 25° C. (77° F.); the *P.G.* 1·225 to 1·235. The aqueous solution is neutral to Litmus paper. When heated in an open capsule it yields irritating acrid vapours of Acrolein. Dilute aqueous solutions are slowly volatilised with the vapour of Water, whilst stronger solutions rapidly volatilise at boiling temperatures. A loop of Platinum Wire, containing a fused bead of Borax moistened with Glycerin, imparts to the edge of a non-luminous flame a transient vivid green colour. When boiled with Potassium or Sodium Hydroxide and Potassium Permanganate Solution, the latter is immediately reduced. The filtered liquid, when made faintly acid with Acetic Acid, yields with Calcium Chloride Solution a white precipitate, insoluble in Acetic Acid, soluble in Hydrochloric Acid. This reaction with alkaline Permanganate forms the basis of a method for the determination of Glycerin which, in the absence of foreign bodies yielding Oxalic Acid on oxidation, has been proved to give very accurate results.

The more generally occurring impurities are those of an inorganic nature, *e.g.*, Arsenic, Copper, Lead, Iron, Calcium, Potassium, Sodium, Ammonium, Chlorides and Sulphates, and mineral impurities, those of an organic nature, Sugars, *e.g.*, Grape and Cane Sugar, foreign organic matter, *e.g.*, Acrolein, Formic Acid or Formates, Butyric Acid, Oxalic Acid or Oxalates, and organic impurities readily charred by Sulphuric Acid. The *B.P.* employs Siebold's modification of the

Gutzeit's test for the detection of Arsenic, which approximately indicates 1 part of Arsenic in 250,000 of Glycerin. The *P.G.* employs the Bettendorf's test, the *U.S.P.* their modified Gutzeit's test, which indicates less than 1 in 100,000. A standard of not less than 2 parts of Arsenic per million is suggested (*C.D.* '08, i. 796). A very great majority of about 450 samples mentioned in this reference showed less than this figure; 4 parts per million, however, may be considered by some to be a sufficiently low limit. Copper, Lead and Iron are detected by Hydrogen Sulphide Solution, the two former in slightly acid, the latter in alkaline solution; Calcium by Ammonium Oxalate Solution; Potassium and Sodium in the residual liquid after separation of the other metals; Ammonium by boiling with Potassium or Sodium Hydroxide Solution. The three latter, however, are unlikely impurities. Chlorides and Sulphates are detected by Silver Nitrate and Barium Chloride or Nitrate solutions respectively.

The *B.P.* and the *U.S.P.* employ Potassio-cupric Tartrate (Fehling's) Solution as a test for Cane and Grape Sugars, the *B.P.* requiring that no precipitate shall be produced even after previous acidification and boiling. The *U.S.P.* specifies quantities of substance and reagent to be used for the inversion, quantity of reagent to be used for precipitation, and time limit within which no cloudiness or precipitate is permitted. Acrolein, Formic Acid or Formates, classed by the *B.P.* as foreign organic matter, may be detected by Silver Ammonio-nitrate Solution. With regard to this test more explicit directions are contained in the *P.G.* monograph than in either the *B.P.* or the *U.S.P.*; the quantities and temperature to which the mixed solutions are to be heated are given, and a definite interval of time (5 minutes), during which neither coloration nor brownish-black deposit should appear, are given. The test for Butyric Acid is, save for the difference in the strengths of the Alcohol, virtually the same in the *B.P.* and the *U.S.P.* The *U.S.P.* and *P.G.* include a test for Oxalic Acid with Calcium Chloride T.S., but no test appears in the *B.P.* The *U.S.P.* adopts a time limit of one hour during which, in testing for readily charred organic impurities, the mixture of Glycerin and Sulphuric Acid is required to develop a colour not darker than yellow. The *B.P.* adopts no time limit. Glycerin should be entirely dissipated when heated at a high temperature, and on ignition should leave no fixed residue. Each of the above tests appears in small type below, with a further detailed comparison between the pharmacopœial methods of application.

Potassio-cupric Tartrate.—Even after it has been acidified with a dilute mineral acid and boiled, Glycerin should give no red precipitate when boiled with excess of T.S. of Potassio-cupric Tartrate, *B.P.*; 5 c.c. of Glycerin mixed with 50 c.c. of Water and 10 drops of Hydrochloric Acid in a small flask, and heated for half an hour on a water-bath, 10 c.c. of this hot liquid mixed with 2 c.c. of Sodium Hydroxide T.S. and 1 c.c. of Alkaline Cupric Tartrate Volumetric Solution should show no yellowish-red cloudiness or precipitate within 6 hours, *U.S.P.*

Sulphuric Acid.—It is officially required to yield either no coloration at all, or at the most a very pale straw coloration when 5 c.c. of Glycerin is shaken with 5 c.c. of Sulphuric Acid, care being taken to keep the mixture well cooled.

A mixture of 5 c.c. each of Glycerin and Sulphuric Acid should acquire, on standing for 1 hour, a colour not darker than yellow, *U.S.P.*

Diluted Sulphuric Acid.—1 c.c. of Glycerin, warmed gently with 1 c.c. diluted Sulphuric Acid, should not give off an unpleasant rancid odour, *P.G.*

Alcohol (90 p.c.) and diluted Sulphuric Acid.—It is officially required that no fruity odour should be produced when equal volumes of Glycerin and a mixture of Alcohol (90 p.c.) and diluted Sulphuric Acid are gently heated together. 5 c.c. of Glycerin mixed with an equal volume of Alcohol (94·9 p.c.) and diluted Sulphuric Acid and gently heated, no fruity odour should be recognisable, *U.S.P.*

Barium Nitrate or Chloride.—A portion of an aqueous solution (1–5 *P.G.*, 1–10 *U.S.P.*) should be unaffected by T.S. of Barium Nitrate. *P.G.*, by T.S. of Barium Chloride, *U.S.P.*

Ammonium Oxalate.—A portion of an aqueous solution, as above, should be unaffected by T.S. of Ammonium Oxalate, *P.G.* and *U.S.P.*

Calcium Chloride.—A portion of an aqueous solution, as above, should be unaffected by T.S. of Calcium Chloride, *P.G.* and *U.S.P.*

Silver Nitrate.—A portion of an aqueous solution, as above, should yield no colour, cloudiness or precipitate with T.S. of Silver Nitrate, *U.S.P.*; should yield not more than an opalescent turbidity, *P.G.*

Ammonia and Silver Nitrate.—It is officially required that at the ordinary temperature no darkening in colour should be produced when a few drops of Silver Nitrate Solution are added to a mixture of Glycerin and Ammonia Solution in equal volumes. 1 gramme of Glycerin and 1 c.c. of Ammonia T.S. warmed on a water-bath to 60° C. (140° F.) and then mixed with 3 drops of Silver Nitrate T.S., there should be neither coloration nor a brownish-black deposit in the mixture within 5 minutes, *P.G.*; no colour, cloudiness or precipitate should appear when an aqueous solution of Glycerin (1–10) is treated in a test-tube with Ammonio-Silver Nitrate T.S., the tube being loosely stoppered to protect it from impurities, and allowed to stand, protected from light, for at least 5 minutes, *U.S.P.*

Sodium Hydroxide.—1 c.c. of Glycerin warmed with Sodium Hydroxide T.S. should neither become coloured nor evolve ammonia or any odour resembling that of glue, *P.G.*

Stannous Chloride.—A mixture of 1 c.c. of Glycerin and 3 c.c. of Stannous Chloride T.S. should not assume a dark colour in the course of an hour, *P.G.*

Hydrogen Sulphide.—An aqueous solution (1–5) should not be affected by T.S. of Hydrogen Sulphide, *P.G.*; an aqueous solution (1–20), acidified with Hydrochloric Acid, should not respond to the time-limit test for heavy metals, *U.S.P.*

Gutzeit's Test.—5 c.c. of an aqueous solution (1 in 10) should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.* It is officially required that within 15 minutes no yellow stain should be produced on a piece of filter paper which has been previously moistened with a drop or two of Mercuric Chloride T.S. and dried, and which is supported over the mouth of a test-tube containing 1 gramme of Arsenic-free Zinc, 5 c.c. of an aqueous 12½ p.c. solution of Hydrochloric Acid (*B.P.*) and 2 c.c. of Glycerin.

Preparations.

SUPPOSITORIA GLYCERINI. GLYCERIN SUPPOSITORIES.

Using a tared basin, ½ oz. of Gelatin, cut small, is covered with Distilled Water, which after two minutes is poured away. When the Gelatin is quite soft, dissolve in 2½ oz. of Glycerin (by weight) on a water-bath, and then evaporate the excess of Water until the product weighs 1563 grains. The mass will contain about 70 p.c. w/w of

Glycerin. It may be moulded into any convenient size when required.

A similar preparation has been in use for many years (*Companion* 1877) as a basis for medicated Pessaries and Suppositories. The formula in the *Companion* arrives at the same result (70 p.c.) *without* evaporation. It is easy by evaporation to obtain a product containing 80 p.c. of Glycerin. The consistency of the mass will vary somewhat with the quality of the Gelatin, *see* p. 556.

Foreign Pharmacopœias.—Official in Austr., Jap. and U.S., Glycerin, Sodium Carbonate and Stearin; Belg., Fr., Mex., and Swiss.

Glycerin Suppositories are much more convenient to use when made with **Cocoa-nut Stearin,** *see* below.

Not Official.

DISPENSING SYRUP.—Glycerin, Syrup, Alcohol (90 p.c.), and Mucilage of Acacia, equal volumes.

An **excipient for pills.** Glycerin by itself is too hygroscopic.

GLYCERIN WITH ROSE WATER.—Glycerin, 1; Rose Water, 3; mix.

SUPPOSITORIA GLYCERINI (*U.S.P.*).—Dissolve 1 of Monohydrated Sodium Carbonate in 10 of Water and add to it 60 of Glycerin (by weight) and 4 of Stearic Acid, heat carefully on a water-bath until effervescence ceases and the liquid is clear. This quantity is for 20 rectal suppositories, which must be kept in tightly-covered glass vessels.

The *B.P.C.* describes it as using equal parts of Monohydrated Sodium Carbonate and Water, but this is due to the omission of a decimal point.

SUPPPOSITORIA GLYCERINI C. STEARINO.—Glycerin, 20 grains; Cocoa-nut Stearin, 40 grains; melt the Stearin, and when just fluid stir in the Glycerin and continue the stirring until the mixture becomes solid. Melt the mass with the least possible heat, and pour into moulds.

They can be used without any lubricant.

UNGUENTUM GLYCERINI. *See* GLYCERINUM AMYLI.

GLYCYRRHIZÆ RADIX.

LIQUORICE ROOT.

FR., RÉGLISSE; GER., SÜSSHOLZ; ITAL., LIQUIRIZIA; SPAN., REGALIZ.

The Root and subterranean Stem, both peeled, of *Glycyrrhiza glabra*, L., and other species.

In the *U.S.P.* the unpeeled Spanish and the peeled Russian root are both official; in the *P.G.* the Russian peeled root is ordered.

The principle **Glycyrrhizin** is comparatively tasteless, the characteristic sweetness being only developed by combination with alkali. It exists in the drug as a combination with Ammonium.

Medicinal Properties.—A demulcent and expectorant in bronchial catarrh and cough. The **liquid extract** helps to disguise the taste of nauseous medicines, but many persons object to the taste of Liquorice. In the form of **extract** and its solution it is a domestic remedy for cough. The **compound powder** is chiefly valuable on account of the Senna and Sulphur it contains, and is an agreeable and mild purgative, well adapted for weak persons and for cases of hæmorrhoids.

Official Preparations of Liquorice.—Of the **Root**, Extractum Glycyrrhizæ, Extractum Glycyrrhizæ Liquidum, Liquor Sarsæ Compositus Concentratus, Pilula Hydrargyri, and Pulvis Glycyrrhizæ Compositus; of the **Extract**, Confectio Sennæ and Decoctum Aloes Compositum; Extractum Glycyrrhizæ Spirituosum, of the **Liquid Extract**, Mistura Sennæ Composita and Tinctura Aloes.

Not Official.—Elixir Adjuvans, Elixir e Succo Glycyrrhizæ *seu* Elixir Pectorale, Glycyrrhizinum Ammoniatum, Mistura Glycyrrhizæ Composita, Pulvis Amygdatæ Laxativus, Syrupus Glycyrrizhæ, and Trochisci Glycyrrhizæ.

Foreign Pharmacopœias.—Official in all the Pharmacopœias; Austr., Belg., Dan., Dutch., Fr. (Réglisse), Hung., Ital. (Liquirizia), Jap. and Ger. (Liquiritia), Mex. (Orozuz), Port. (Alcacus), Russ., Span. (Regaliz), Swiss and U.S.; all *G. glabra.*

Descriptive Notes.—The Liquorice Root of commerce exists in several forms. The English root is never sold in the decorticated form, but either fresh or dried. Some of the fresh Liquorice Root of commerce also comes from France. The dried Liquorice Root consists of the product of at least two plants.

That derived from France, Spain and Sicily is the product of *G. glabra*; but that from Russia, Asia Minor and Persia is chiefly the product of *G. glandulifera*, and is recognisable by its redder tint, more scaly surface, and slight acridity and bitterness. As a rule the Liquorice Root of commerce consists of a larger proportion of underground stem than of root. As the root is sweeter than the stem, samples richest in root are of greater value. The root of *G. glabra* has a thin brown bark, marked here and there with short transverse scars, is yellowish within and has a radiate and porous woody structure and a fibrous fracture, a sweet taste and characteristic odour and flavour when chewed. The underground stem does not exhibit transverse scars, but at the cut ends shows a small central depression caused by shrinkage of the pith.

French Liquorice Root is usually of good quality, and is also sold in the decorticated or peeled form. Spanish Liquorice Root from Tortosa occurs in trimmed bundles of uniform size and length and of fairly uniform pieces; that from Alicante in loosely packed bales, the root being of varying size and quantity. Sicilian Liquorice is usually peeled and, like the French, often cut up into short pieces 1 inch or less in length. Russian Liquorice is sold both in the unpeeled and in the peeled state. It is often in very large tapering pieces, sometimes blackened and hollowed near the crown of the root. It gives a paler powder than the French and Sicilian, and is somewhat acrid and bitter. Persian or Bussorah root is in long cylindrical pieces, an inch or more in diameter, and is not sold in the peeled state. The official root is limited to peeled root and peeled subterranean stem of *Glycyrrhiza glabra*, Linn., and other species The last three words seem superfluous, since the character given evidently excludes that of *G. glandulifera*, Waldst. and Kit., which affords the Liquorice Root of Eastern Europe and Western Asia, some of the characters of the official drug being that it should be free from bitterness, and that it should be dark brown in colour, longitudinally wrinkled, but not scaly, which are the distinctive characters of the root of *G. glandulifera*.

It is not stated how these characters are to be ascertained from the root which is already peeled as purchased in commerce, and directions for peeling the dried root are not given. The acridity of Eastern Liquorice Root is due to a resin contained principally in the bark, and the bitterness to a principle named Glycamarin; the sweetness is due to Glycyrrhizic Acid which exists partly in combination with Ammonia in the fresh root, in which state it is sweeter, since it is then more soluble in Water.

Tests.—The ash of Liquorice Root amounts to from 3 to 4 p.c., and should not much exceed the latter figure.

Samples of fine English root examined in the author's laboratory yielded on an average 1·5 p.c. of ash; samples of the English decorticated powdered root left from 3·4 to 4·95 p.c. of ash, with an average of 3·76 p.c.

Preparations.

EXTRACTUM GLYCYRRHIZÆ. EXTRACT OF LIQUORICE.

An aqueous extract, prepared by cold maceration, coagulation of Albumen at 212° F. (100° C.), and the subsequent evaporation to a soft extract.

Dose.—5 to 30 grains = 0·32 to 2 grammes.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr. (Ext. Réglisse), Hung., Ital., Jap., Mex., Port., Russ. and Span., from root with cold Water; U.S. (Extractum Glycyrrhizæ Purum), from root with Water and Ammonia. The **Crude Extract in sticks** (*Succus Liquiritiæ*) is official in Austr., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Norw., Russ., Swed. and Swiss; U.S. (Extractum Glycyrrhizæ); **Depuratum** from Crude Extract is official in Austr., Ger., Hung., Norw., and Swed.

Under the name **Liquorice Juice**, an aqueous extract, prepared by boiling the root with Water, is commercial in the form of sticks; **Solazzi Juice** is the best known brand.

EXTRACTUM GLYCYRRHIZÆ LIQUIDUM. LIQUID EXTRACT OF LIQUORICE.

An aqueous fluid extract, treated the same as for the extract, but evaporated to sp. gr. 1·2; to this is added $\frac{1}{4}$ of its volume of Alcohol (90 p.c.).

Dose.—$\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c.

The finished product is usually acid.

Ammonia is used for preserving the sweet principle; so long as the alkalinity is maintained there is no falling of the dirty-looking deposit which is often seen at the bottom of the Fluid Extract of Liquorice bottle.

Fluidextractum Glycyrrhizæ (*U.S.P.*).—1 in 1 Fluid extract, obtained by treating 100 of the Liquorice Root with boiling Water until exhaustion, evaporating the liquid to 45, when cold adding 45 of Alcohol (95 p.c.); after 3 days filter, and evaporate to 50, and add Glycerin 25, Ammonia Water 5, Alcohol (95 p.c.) 20, and Water *q.s.* to make 100.

Foreign Pharmacopœias.—Belg., with Alcohol (30 p.c.); Mex., Ammonia and Alcohol; Swed., Ammonia and diluted Alcohol; Swiss, with Chloroform Water and Alcohol (90 p.c.).

Test.—Liquid Extract of Liquorice varies very considerably in its character. A good liquid extract prepared from fresh English root had a sp. gr. of 1·130 to 1·135; contained from 33·6 to 37·6 p.c. w/v of total solids and about 18 p.c. w/v of Absolute Alcohol.

The palatability of commercial liquid extracts also manifests considerable variation, some being almost bitter in taste, and few bearing any comparison with a liquid extract made from fresh English root.

EXTRACTUM GLYCYRRHIZÆ SPIRITUOSUM.

Dissolve 10 of Extract of Liquorice in a small quantity of Distilled Water, add 5 of Alcohol (90 p.c.) and make up with Distilled Water to 20.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

This is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Extracta Liquida.—Any Liquid Extract, defined in the Text of the Pharmacopœia, containing less than one-fourth of its weight of Alcohol (90 p.c.), may have the proportion of Alcohol (90 p.c.) increased, to an extent not exceeding one-fourth of the weight of the Extract, in India and other tropical countries where otherwise the preparation would be liable to ferment.

PULVIS GLYCYRRHIZÆ COMPOSITUS. COMPOUND POWDER OF LIQUORICE.

N.O.Syn.—PULVIS LIQUIRITIÆ COMPOSITUS, PULVIS PECTORALIS KURELLÆ.

Senna, 2; Liquorice Root, 2; Fennel Fruit, 1; Sublimed Sulphur, 1; Refined Sugar, 6.

Dose.—60 to 120 grains = 4 to 8 grammes.

As a mild aperient, a teaspoonful or more for adults, less in proportion for children.

For diabetic patients the late Balmanno Squire suggested that the Sugar and Liquorice should be replaced by Almond-meal and Powdered Gum Acacia. It can be ordered as **Pulvis Amygdalæ Laxativus.** *See* p. 574.

Tests.—Compound Liquorice Powder usually contains from 3·0 to 5·0 p.c. and should not contain more than 6·0 p.c. of moisture, the ash ranges from 4 to 6 p.c., and the soluble ash from 2 to 3 p.c., averaging about 2·5 p.c. The percentage of Sulphur may be determined by extracting the sample with Carbon Bisulphide, filtering, evaporating off the solvent, treating with Fuming Nitric Acid, a little Bromine, and a few crystals of Potassium Chlorate, removing the Nitric Acid by evaporating to a small bulk with Hydrochloric Acid, moistening with Hydrochloric Acid, and again evaporating to a small bulk. The Sulphur is oxidised to Sulphuric Acid, which may be determined in the usual manner by precipitation with Barium Chloride Solution. It is generally present to the extent of about 8 to 9 p.c. Ground Olive stones, Maize Starch, exhausted drugs, etc., have been used in the adulteration of Liquorice Powder. Ground Olive stones and Maize Starch may be detected by the microscopical appearance of the specimen. A criterion of exhausted drugs is afforded by a joint determination of the percentage w/v of the total extractive matter yielded to Alcohol (70 p.c.) and the percentage of Sugar, the difference between the determinations should be from 10·5 to 13·0 p.c. A specimen of compound Liquorice powder prepared in the author's laboratory from the finest English decorticated root gave the following figures, when examined as above: Moisture, 5·9 p.c.; Ash, 5·8 p.c.; Soluble Ash, 3 p.c.; Extracted by Alcohol (70 p.c.), 59·2 p.c.; Sugar, 49 p.c.; Sulphur, 9 p.c.; Extractive Matter, less Sugar, 10·2 p.c.

Foreign Pharmacopœias.—Official in Mex. and Russ., formula the same; Austr., Belg., Dan., Dutch, Fr., Ger., Jap., Norw., Swed. and U.S., almost the same. Span. Not in the others.

Not Official.

ELIXIR ADJUVANS.—Fluid Extract of Liquorice, 12; Aromatic Elixir, 88.—*U.S.P.*

This has been incorporated in the *B.P.C.*

ELIXIR E SUCCO GLYCYRRHIZÆ, *seu* **ELIXIR PECTORALE, LIQUOR PECTORALIS** (*Dan.*, *Ger.*, *Norw.*, *Russ.*, *Swed.* and *Swiss*).—Purified Extract of Liquorice, 1; Fennel Water, 3; Anisated Liquid Ammonia (p. 135), 1; (all by weight); mix.

GLYCYRRHIZINUM AMMONIATUM.—Dark brown or brownish-red odourless scales, possessing a sweet taste. They are readily soluble in Water, and are also soluble in Alcohol (90 p.c.).

An elegant substitute for Liquorice in mixtures which are neither acid nor alkaline.

A scale preparation made by treating Liquorice Root with Water containing 5 p.c. of Water of Ammonia, and adding Sulphuric Acid to the liquor so long as a precipitate is produced; collect this and wash it with cold Water until free from acid; redissolve in dilute Ammonia and put it through the precipitation process for a second time, wash it and redissolve in dilute Ammonia and spread on glass plates to dry.—*U.S.P.*

This has been incorporated in the *B.P.C.*

Tests.—When dissolved in Water and boiled with Potassium Hydroxide Solution, an evolution of Ammonia gas occurs. A piece of moistened red Litmus paper held over the tube is immediately turned blue, and a glass rod moistened with Hydrochloric Acid held in its vicinity yields dense white fumes of Ammonium Chloride. The aqueous solution yields, on the addition of an acid, a precipitate of Glycyrrhizin which, when washed with diluted Alcohol until free from acid and dried, forms an amorphous yellow powder. Glycyrrhizin Ammoniatum should not leave more than a trace of ash when ignited with free access of air.

MISTURA GLYCYRRHIZÆ COMPOSITA.—Pure Extract of Glycyrrhiza, 3; Syrup, 5; Acacia, granulated, 3; Camphorated Tincture of Opium, 12; Wine of Antimony, 6; Spirit of Nitrous Ether, 3; Water *q.s.* to make 100.—*U.S.P.*

Average Dose.—2 fl. drm. = 7·1 c.c.

This has been incorporated in the *B.P.C.*, employing the same quantities but using the corresponding preparations of the *B.P.*

PULVIS AMYGDALÆ LAXATIVUS.—Senna, 2; Fennel, 1; Sublimed Sulphur, 1; Almond-meal, 7; Powdered Gum Acacia, 1. Mix. It is also known as 'Balmanno Squire's Powder.'

SYRUPUS GLYCYRRHIZÆ.—Liquorice Root 4 is extracted with a mixture of Ammonia solution 1, and Distilled Water 20, for twelve hours, pressed, and the expressed liquid evaporated on the water-bath to 2, mixed with Alcohol (90 p.c.) 2; and, after standing twelve hours, filtered, and the filtrate made up to 20 with simple Syrup. (All parts by weight.)

Foreign Pharmacopœias.—Official in Ger., Russ., Swed. and Swiss; Dutch does not use Ammonia.

The *U.S. National Formulary* Syrup is prepared by dissolving pure Extract of Liquorice 1 in Distilled Water 4, adding Sugar 5, straining, adding Glycerin 1 and sufficient Water to produce 8.

TROCHISCI GLYCYRRHIZÆ.—Extract of Liquorice, 18; Anise Oil, 3; Acacia Lozenge Mass, 60, to make six lozenges. —*Brompton*, and *City Chest*.

This has been incorporated in *B.P.C.* giving the synonym 'Brompton Cough Lozenge.'

U.S.P. has a Trochiscus Glycyrrhizæ et Opii, containing 15 grammes of Extract of Glycyrrhiza, 0·5 gramme of Powdered Opium, and 0·2 c.c. of Oil of Anise in 100.

Fr. has Pâte de Réglisse officinale containing about 0·02 p.c. of Extract of Opium.

GOA POWDER. *See* AKAROBA.

GOSSYPIUM.

COTTON.

B.P.Syn.—COTTON-WOOL.

FR., COTON HYDROPHILE; GER., GEREINIGTE BAUMWOLLE; ITAL., COTONE ASSORBENTE; SPAN., ALGODON HIDROFILO.

The Hairs of the Seed *Gossypium Barbadense*, L., and of other species of Gossypium, from which, by suitable treatment, the fatty matter has been removed. This is commonly known as **Absorbent Cotton-Wool.**

Cotton-Wool is medicated with Carbolic Acid, Salicylic Acid, Boric Acid, Eucalyptol, Thymol, Iron salts, Mercuric Chloride, Double Cyanide, Sal Alembroth, Iodine, Iodoform, and other substances.

Official Preparation.—Used in the preparation of Pyroxylin.

Foreign Pharmacopœias.—Austr., Dutch, Ger., Jap., Russ., Swed. and Swiss (Gossypium Depuratum), Ital. (Cotone Assorbente), Mex. (Algodon and Algodon hydrofilo), Port. (Algodoeiro), Span. (Algodon), U.S. (Gossypium Purificatum), Fr. (Coton Hydrophile), not washed, Belg. (Coton hydrophile). Not in the others. Medicated Cottons have been inserted in Dutch and Mex.

MOUTH AND NOSE PROTECTOR.—For use in poisonous and injurious trades. Squire and Sons exhibited this respirator at the International Health Exhibition (1884) and obtained for it a bronze medal. It consists of layers of washed and sterilised Cotton-Wool placed between layers of Perforated Zinc and Perforated Cardboard, formed into a pliable respirator which covers the mouth and nose.

Gamgee Tissue or Absorbent Gauze and Cotton-Wool Tissue, which consists of layers of absorbent Cotton-Wool enclosed in absorbent Gauze, is a favourite dressing, and is convenient for applying lotions.

Tela Depurata. Purified Mull (*Ger.*).—This mull should have a breadth of 100 centimetres, and each square metre should weigh at least 30 grammes, and each square centimetre should contain at least 24 threads, when not otherwise ordered.

Not Official.

GOSSYPII RADICIS CORTEX.

The Bark of the Root *Gossypium herbaceum*, L., and of other species of Gossypium.

It is official in the *Ind.* and *Col. Add.* for India and the Eastern, North American and West Indian Colonies.

Medicinal Properties.—The Tincture and Fluid Extract have been used in America, and occasionally in Europe, as a substitute for Ergot in labour, and to check metrorrhagia.—*L.* '94, ii. 1298.

Foreign Pharmacopœias.—Official in U.S. Not in the others.

Descriptive Notes.—The bark of the root as met with in commerce occurs in the form of thin, flat or slightly quilled strips more or less curled in drying, dark brown externally, with a thin outer layer which, when abraded, shows a reddish-brown coloured layer beneath. The inner surface is of a yellowish-white colour when recently dried, but darkens into brownish-red when the bark is kept; it is finely striated with projecting medullary rays. The transverse section shows the bast in radiating lines which are broader at the base. The transverse fracture is laminate and fibrous, and although the bark is easily split longitudinally, it is only broken transversely with difficulty. It has very little odour and an astringent and faintly acid taste.

A spurious cotton bark is sometimes met with which has a dark brown inner surface and is more easily broken transversely.

DECOCTUM GOSSYPII RADICIS CORTICIS. (*Ind.* and *Col. Add.*).—Boil 4 of Cotton Root Bark with 40 of Distilled Water until reduced to 20, strain and make up to 20.

Dose.—½ to 2 fl. oz. = 14·2 to 56·8 c.c.

For India and the Eastern, North American and West Indian Colonies.

This has been incorporated in the *B.P.C.*

EXTRACTUM GOSSYPII RADICIS CORTICIS LIQUIDUM. (*Ind.* and *Col. Add.*).—A 1 in 1 fluid extract of Cotton Root Bark prepared by percolation, using as a menstruum first Alcohol (90 p.c.), containing 25 p.c. Glycerin, and finally Alcohol (90 p.c.).

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

For India and the Eastern, North American and West Indian Colonies.

This has been incorporated in the *B.P.C.*

TINCTURA GOSSYPII.—Dried Bark of the Root of the Cotton Plant in powder, 1; percolate with sufficient Alcohol (60 p.c.) to produce 4.

Dose.—1 fl. drm. = 3·6 c.c.

This has been incorporated in the *B.P.C.*

GRANATI CORTEX.

POMEGRANATE BARK.

FR., ÉCORCE DE GRENADIER; GER., GRANATRINDE; ITAL., MELOGRANATO; SPAN., CORTEZA DE GRANADO.

The dried Bark of the Stem and Root of *Punica Granatum*, L.

Neither the *B.P.* nor the *U.S.P.* requires the Bark to yield any definite percentage of alkaloids. The *P.G.* requires it to yield 0·4 p.c. w/w of alkaloids when determined by the process given below. The *Fr. Codex* (1908) requires the dried bark to yield not less than 0·25 p.c. of alkaloids.

The Pomegranate-root alkaloids are Pelletierine (Punicine), Isopelletierine (Isopunicine), Methylpelletierine (Methylpunicine) and Pseudopelletierine (Pseudopunicine, Granatonine). The first two constitute the **Pelletierine** of medicine, the last two are inactive. Pelletierine is a volatile liquid, but forms stable salts.

Medicinal Properties.—Astringent and anthelmintic. It is considered effective in killing tapeworm; the dose should be preceded and followed by a purgative. Pelletierine Sulphate is used for the same purpose.

Incompatibles.—Alkalis, Lime Water, Metallic salts, Gelatin.

Official Preparation.—Dococtum Granati Corticis.

Not Official.—Extractum Granati, Pelletierinæ Sulphas and Pelletierinæ Tannas.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Jap., Fr. (Grenadier), Ger., Hung., Ital. (Melogranato), Port. (Romeira), Mex., Russ. and Span. (Granado), Swiss and U.S. Not in Norw. or Swed.

Descriptive Notes.—The commercial article consists chiefly of the stem bark, which can be distinguished by the presence of lichens and of a dark green phelloderm layer from that of the root, which has conchoidal depressions and is more or less curved or twisted, that of the stem being straight. The colour is yellowish-grey externally and brownish-yellow on the inner surface. The fracture is short and of a pale yellow, and presents under a lens a tesselated or latticed appearance, from the presence of numerous fine radial lines crossed by fine tangential lines. It is about $\frac{1}{12}$ in. in thickness. The official bark is stated to be 2 to 4 in. ($\frac{1}{2}$ to 1 dcm.) in length, and $\frac{1}{2}$ to 1 in. (12 to 25 mm.) in width. The taste is very astringent, with a slight bitterness, but it has no distinctive odour. As the root bark may contain six times as much alkaloid as the stem bark, the drug is more valuable in proportion to the amount of root bark it contains.

When examined under the microscope the powdered bark should contain no other ingredients except round, single starch grains with a diameter of 0·0025–0·008 mm., rarely compound starch grains, characteristic cork cells, sclerenchymatous cells, cells containing single or clustered crystals of Oxalate, parenchymatous cells and sieve tubes.—*P.G.* and *Jap.*

Tests.—Pomegranate Bark when allowed to macerate for an hour in slightly acidified Water, yields a yellowish solution. The addition of a few drops of Ferric Chloride Test-solution to a portion of this liquid affords a bluish-black coloration, which is changed to a yellowish-red on the addition of five times the volume of Lime Water, and on standing an orange-red flocculent precipitate is thrown out. The process for the determination of the alkaloids officially adopted by the *P.G.* is as follows:—A weighed quantity of 12 grammes of Pomegranate Root dried at 100° C. (212° F.), in a fairly fine powder, is introduced into a stoppered vessel and vigorously shaken with 90 grammes of Ether and 30 grammes of Chloroform. A measured quantity of 10 c.c. of a mixture of 2 parts by weight of Sodium Hydroxide Solution (15 p.c. w/w) and 1 part by weight of Water is then added, and the mixture allowed to stand with intervals of frequent shaking. A measured quantity of 10 c.c. of Water, or a sufficient quantity to cause the powdered root to agglomerate when vigorously shaken and the Chloroform-ether solution to separate completely, is added. A weighed quantity of 100 grammes of the clear Chloroform-ether solution is filtered (after an interval of one hour's rest), through a dry, well-covered filter into a separator, and the alkaloids are extracted from this solution by agitation with 50 c.c. of Hundredth-normal Volumetric Hydrochloric Acid Solution. After complete separation the latter is filtered through a small filter paper moistened with Water into a flask of 100 c.c. capacity, and the extraction is repeated with 3 separate quantities each of 10 c.c. of Water, the aqueous shakings being filtered through same filter, the latter is washed with Water and the mixed liquids are diluted with Water to

100 c.c. A measured quantity of 50 c.c. is transferred to a stoppered flask of about 200 c.c. capacity, and about 50 c.c. of Water and sufficient Ether to form a layer of about 1 cm. added. After the addition of 5 drops of Iodeosin Solution, Hundredth-normal Volumetric Potassium Hydroxide Solution is added until the lower aqueous layer assumes a pale rose-red coloration, the mixture being well shaken after each addition; not more than 11 c.c. of the solution should be necessary to produce this coloration. The amount of Pelletierine corresponding to this titration figure is 0·395 p.c. w/w. Using the mean molecular weights of Pelletierine and Methylpelletierine in the calculation the percentage amounts to not less than 0·41 p.c. w/w. The *Fr. Codex* (1908) process is a volumetric one, the result of the titration being calculated from a factor based on the mean molecular weights of Pelletierine and Methyl-pelletierine. The process is carried out on the bark dried at 100° C. (212° F.), which is required to yield not less than 0·25 p.c. of alkaloids. The percentage of alkaloid varies between 0·5 to 0·7 p.c. w/w, and may even be as high as 1·0 p.c. w/w. The percentage of ash varies between 5·0 and 13·0 p.c., and should not exceed 15·0 p.c.

Preparation.

DECOCTUM GRANATI CORTICIS. Decoction of Pomegranate Bark.

Boil 4 oz. of Pomegranate Bark with 24 fl. oz. of Distilled Water for ten minutes, strain and wash the residue with Distilled Water, *q.s.* to yield 20 fl. oz. (1 in 5)

Dose.—½ to 2 fl. oz. = 14·2 to 56·8 c.c.

Foreign Pharmacopœias.—Official in Belg., 1 and 6, boil to 4; Fr. (Apozème), 1 and 12½, boil to 9; Ital., 1 in 50; Port., 1 and 7½, boil to 5; Span., 1 in 10. Not in the others.

Not Official.

An excellent remedy for tapeworm is as follows:—

Bruised Root-bark of Pomegranate, 2 oz.; Boiling Water, 24 fl. oz.; macerate for 24 hours, and then boil till reduced to 18 fl. oz. A third part early in the morning, a third part again in half an hour, and the remainder in another half-hour. A dose of Castor Oil should have been taken the previous morning, and solid food abstained from on that day. This rarely fails to bring away the entire worm in two hours, and the head (at the thinnest end) should be diligently sought for. This form was given in *Companion* 1873.

EXTRACTUM GRANATI.—Exhaust Pomegranate Root-bark with Alcohol (60 p.c.), distil off the Alcohol and evaporate to the consistence of an Extract.

10 of Root-bark yield 3½ of Extract.

Foreign Pharmacopœias.—Official in Austr., Dutch, Hung., Port. and Russ. Not in the others.

Fluidextractum Granati is official in U.S.; is prepared by percolating 100 grammes of Pomegranate in No. 30 powder with a mixture of Glycerin 10 c.c. and Alcohol (49 p.c.) *q.s.* to make 100 c.c. of Fluidextract.

PELLETIERINA. Pelletierine, $C_8H_{15}NO$, eq. 140·10.—A colourless, oily liquid, having an aromatic odour, and becoming brown on exposure to the air.

It should be kept in well-stoppered glass bottles of a dark amber tint and in a cool atmosphere.

Tests.—Pelletierine has a sp. gr. at 0° C. (32° F.) of 0·988, and a boiling point of 195° C. (383° F.), at which temperature it distils.

It is soluble in Water, and readily soluble in Alcohol (90 p.c.), Ether and Chloroform.

PELLETIERINÆ SULPHAS.—A white, crystalline, non-hygroscopic mass, which should be preserved from the light. It is official in *Fr. Codex* (1908).

Dose.—6 grains = 0·4 gramme, prescribed with 7 grains = 0·46 gramme of Tannic Acid.

The **Pelletierine de Tanret** has been improperly called Pelletierine Tannate, on account of its being a mixture of Pelletierine Sulphate and Tannin, but it is quite distinct from the true Tannate.

PELLETIERINÆ TANNAS. Pelletierine Tannate, Punicine Tannate. —A yellowish, amorphous, odourless powder, prepared from Pomegranate Bark. It possesses an astringent taste.

Solubility.—1 in about 700 of Water, 1 in 80 of Alcohol.

Dose.—5 to 8 grains = 0·32 to 0·52 gramme.

Foreign Pharmacopœias.—Official in Ital. and U.S.

Tests.—Pelletierine Tannate, dried over Sulphuric Acid and heated, turns brown at 150° C. (302° F.) and softens at about 165° C. (329° F.). It is faintly acid in reaction towards blue Litmus paper. The aqueous solution affords a precipitate with Mercuric-potassium Iodide (Mayer's) Solution, the precipitate becoming granular and yellow coloured. It yields a white precipitate with Lead Acetate Solution, Mercuric Chloride T.S., and Zinc Chloride Solution, but no precipitate with Platinic Chloride T.S. Ammonia Solution produces a white precipitate soluble in Chloroform or in an excess of the reagent, the latter producing a yellowish-red Solution. The aqueous solution yields a black precipitate of reduced metallic Silver when heated with Silver Nitrate Solution. Sulphuric Acid produces a yellow colour, turning slowly to green on warming, and finally to purple. Sulphuric Acid containing a trace of Selenious Acid gives a light bluish-green coloration, gradually becoming dark green.

Not Official.

GRINDELIA.

The Leaves and Flowering Tops of *Grindelia squarrosa*, Dunal, and *Grindelia robusta*, Nutt., from California.

It is now official in the *Ind.* and *Col. Add.* for the Australasian and the North American Colonies.

Medicinal Properties.—Antispasmodic, expectorant, slightly diuretic. Has been recommended in asthma, hay fever, bronchitis, whooping-cough, laryngismus stridulus, and cystitis.

Prescribing Notes.—*The Liquid Extract, whether made by U.S.P. or Ind. and Col. Add., has a peculiar, bitter, persistent taste, which requires a good deal of covering. The addition of Spirit of Chloroform, Syrup of Orange and Glycerin, is useful for this purpose. The so-called 'Alkaline Fluid Extract of Grindelia,' which is now introduced into the Ind. and Col. Add. as Extractum Grindeliæ Liquidum, mixes more readily with Water, and makes a better-looking and more palatable draught than either of the others.*

Foreign Pharmacopœias.—Official in Fr. and U.S. Not in the others.

Descriptive Notes.—The dried Leaves of *G. squarrosa*, Dunal, and *G. robusta*, Nuttall, are given. There is some difficulty in distinguishing these two species, since both have reflexed phyllaries. But as a rule the upper leaves of *G. squarrosa* taper towards the base, whilst those which are referred in the *P.B.* to *G. robusta* are broader towards the base and are somewhat shorter in proportion. The specific distinction depends on the nature of the achenes, which in *G. squarrosa* are 4-angled and without distinct auricular appendages, whilst those of *G. robusta* are bidentate. The species of the genus are very variable, and it has been shown by Perrédès (*Ph. Jour.* (4) 23, p. 433) that the plant recognised in commerce as *G. robusta*, Nuttall, is really the *G. camporum* of Greene. It is this species that is now almost exclusively imported. When Grindelia was first introduced into this country it consisted of *G. squarrosa*. The Leaves of *G. squarrosa* are officially described in the *Ind.* and *Col. Add.* as alternate, pale green, smooth, coriaceous, brittle, oblanceolate or oblong lanceolate or elongate lanceolate, the lower leaves tapering considerably below. But these Leaves are no longer in commerce. The leaves of *G. robusta* are described as similar in texture and colour, but shorter and more oblong, with a cordate amplexicaul base, are furnished with a few glandular hairs, and are sharply serrate at the margin. But these characters are those of the *Grindelia camporum* of Greene. In both species the relaxed bracts of the involucre and the leaves are more or less covered with glossy patches of exuded resin. The taste is pungently aromatic and bitter, and the odour is balsamic.

Preparation.

EXTRACTUM GRINDELIÆ LIQUIDUM. Liquid Extract of Grindelia.

Percolate 20 of Grindelia with Alcohol (90 p.c.) until exhausted, distil off the Alcohol, and add to the residue 10 of Distilled Water and 2 of Sodium Bicarbonate; stir together, and after the Extract is dissolved and the effervescence is over, add Distilled Water to make 15, and finally Alcohol (90 p.c.), *q.s.* to yield 20 of product.

Dose.—10 to 20 minims = 0·6 to 1·2 c.c.

This is official in the *Ind.* and *Col. Add.* for the Australasian and the North American Colonies.

The official text directs the Sodium Bicarbonate to be previously added to the Distilled Water, but as it will not dissolve there is no point in it. This preparation deposits on keeping.

U.S. Fluidextract (1 in 1 w/v) by percolation with a mixture of Alcohol (95 p.c.) 3, Water, 1; Fr. Fluid Extract (1 in 1 w/w) with Alcohol (75 p.c.).

Not Official.

EXTRACTUM GRINDELIÆ.—An Alcohol (90 p.c.) percolate, distilled and evaporated to an Extract. 100 of Grindelia yield 15 of Extract.

Dose.—3 grains = 0·2 gramme, three times a day.

GUAIACI LIGNUM.

GUAIACUM WOOD.

Fr., Guajacum Ger., Guajakholz; Ital., Legno Guajaco; Span., Leno de Guayaco.

The Heart-wood of *Guaiacum officinale*, L., or of *Guaiacum sanctum*, L.

It yields about 26 p.c. of Resin, consisting of Guaiacic, Guaiaconic and Guaiacinic Acid. It also contains two Saponins, a neutral Guaiac-saponin and Guaiacsaponic Acid.

Imported from St. Domingo and Jamaica.

Medicinal Properties.—*See* 'Guaiaci Resina.'

Foreign Pharmacopœias. Official in all except Belg., Dan., Dutch, Fr., Hung. and Swed.

Descriptive Notes.—The official Guaiacum Wood consists of the dark-coloured heart-wood only, but in commerce it is usually met with in the form of turnings, containing more or less of the yellowish sapwood, and sometimes of boxwood, or other woods used in turning. The turnings often require sifting to free them from powder. As Guaiacum Wood is heavier than Water and sinks in it, such admixtures can generally be separated by this means. The Wood is distinguished from other similar heavy dark greenish-brown wood by the medullary rays being one-cell broad, and four, or sometimes three to six cells high (*P.G.*); by the usually solitary vessels with small pits, the numerous sphæraphides of Calcium Oxalate, and the thick-walled parenchyma with narrow lumen. It has a slightly acrid taste, and when heated a faintly aromatic odour. Although the use of the wood of *G. sanctum* is also permitted by the *P.B.*, no distinctive characters are given for it.

Test.—Guaiacum Wood, when digested with Alcohol (90 p.c.) and filtered, yields a filtrate which gives, on the addition of diluted Ferric Chloride Test-solution, a blue coloration. The ash varies from 1 to 2 p.c.

GUAIACI RESINA.

GUAIACUM RESIN.

Fr., Résine de Gaïac; Ger., Guajakharz; Ital., Resina de Guajaco; Span., Resina de Guayaco.

The Resin obtained from the Stem of *Guaiacum officinale*, L., or of *Guaiacum sanctum*, L.

On dry distillation it yields Guaiacol similar to that found in Creosote.

Solubility.—About 90 p.c. is soluble in Absolute Alcohol, Ether, Chloroform, Aromatic Spirit of Ammonia, and alkaline solutions; almost insoluble in Petroleum Spirit.

Medicinal Properties.—Stimulant, diaphoretic, and alterative. It is employed in chronic forms of rheumatism and gout, especially in old people. It is used in acute tonsillitis, also in dysmenorrhœa, amenorrhœa, and syphilitic affections.

Generally prescribed in combination with other medicines.

It is innocuous, and might be taken for an indefinite period of time, and looked upon as a condiment rather than as a drug, as harmless as Ginger or any other condiment. Guaiacum possesses a considerable power, but less than Colchicum, in directly relieving patients suffering from gouty inflammation of any part; it might be given whenever there was but little fever. Guaiacum taken in the intervals of gouty attacks has a considerable power of averting their recurrence; in fact, it is a very powerful prophylactic. Guaiacum does not appear to lose its prophylactic power by long-continued use.—*L.* '96, i. 1494; *B.M.J.* '96, ii. 1325.

In sub-acute or chronic gout, in addition to Colchicum, 5 to 10 grains of the resin may very usefully be given in cachets two or three times daily. The cachets are far preferable to the tincture in a mixture, as the latter is nauseous and the precipitated resin tends to cling obstinately to the tongue and fauces.—A. P. Luff, *Pr.* '07, i. 166.

Confidence expressed in the efficacy of Guaiacum in many forms of chronic gout, in irregular gout, and also as a prophylactic of gout. It is best administered in the form of tablet, or as a cachet.—*B.M.J.* '00, i. 843.

10 grains in a tablespoonful of Malt Extract two or three times a day, beginning a week before menstruation is expected, given to relieve the pain.—*B.M.J.* 02, i. 1195.

Dose. 5 to 15 grains = 0·32 to 1 gramme.

Prescribing Notes.—*Tragacanth is better for the powder of Guaiacum Resin in Mixtures; Mucilage of Acacia is best for the Ammoniated Tincture:—Mucilage of Acacia, ½ fl. oz.; Ammoniated Tincture, 6 fl. drm.; Water, to 6 fl. oz.*

Incompatibles.—Mineral Acids, Spirit of Nitrous Ether.

Official Preparations.—Of the **Wood,** used in the preparation of Liquor Sarsæ Compositus Concentratus; of the **Resin,** Mistura Guaiaci, Tinctura Guaiaci Ammoniata, Trochiscus Guaiaci Resinæ; used in the preparation of Pilula Hydrargyri Subchloridi Composita.

Not Official.—Confectio Guaiaci Composita, Pulvis Guaiaci Composita, Tinctura Guaiaci, and Trochiscus Guaiaci.

Foreign Pharmacopœias.—Official in Austr., Fr. (Résine de Gaïac), Hung., Ital., Jap. and Norw. (Resina Guajaci), Mex. (Resina de Guayacan), Port., Span., Swed., Swiss and U.S. Not in the others.

Descriptive Notes.—The Resin occurs in commerce in irregular masses, or in nearly globular tears varying in size from ½ to 1 inch or more in diameter. The splinters of the Resin should be transparent, and of a yellowish-green or reddish-brown tint. The tear is the purest form, the Guaiacum in mass varying considerably in purity, the purest being obtained by heating the logs over a fire, and the inferior by boiling the chips in a solution of salt; some specimens of Guaiacum Resin in mass contain much woody matter and other impurities.

Tests.—Guaiacum Resin emits a balsamic odour when warmed, and possesses a slightly acrid taste. A solution of the Resin in Alcohol (90 p.c.) yields on the addition of diluted Ferric Chloride Test-solution a blue coloration, and if the mixture be shaken with Chloroform the blue colour passes into the chloroformic layer. Paper moistened with the alcoholic solution becomes blue when exposed to the fumes of Nitric Acid. The percentage of matter insoluble in Alcohol (90 p.c.) should not amount to more than 10 p.c. The impurities insoluble in Alcohol (90 p.c.) in good block Resin amount to 2·9 to 10 p.c. The Acid value of crude lump Guaiacum varies from 90 to 95, the Alcohol-purified Resin from 90 to 100, the natural tears from 70 to 75. The *U.S.P.* gives the limits as not less than 70 nor more than 80. The *B.P.* gives neither the Acid value, the limit of matter insoluble in Alcohol (90 p.c.), nor the percentage of ash. The *U.S.P.* limit of matter insoluble in Alcohol (94·9 p.c.) is 15 p.c. and the ash not more than 4 p.c. The ash of good commercial samples of the Resin varies from 1 to 4 p.c., and should average 3·0 p.c.

A standard of not less than 90 p.c. of matter soluble in Alcohol (90 p.c.) and not more than 3 p.c. of ash has been recommended.

The more generally occurring impurities are Colophony Resin, the similar but yellowish-brown Peruvian Guaiacum, and excess of woody fibre; Colophony may be detected by the very high Acid value. The *U.S.P.* macerates the powder with 4 or 5 times its weight of Petroleum Benzin, and requires that the filtrate should be colourless and that it should not give a green coloration on the addition of an equal volume of a 1 in 1000 Cupric Acetate Solution. Colophony and Peruvian Guaiacum may also be detected by dissolving the Resin in Chloroform and adding Bromine Solution. A blue coloration is yielded by the pure Resin, a red coloration by adulterated specimens. Excess of woody matter is indicated by the solubility in Alcohol (90 p.c.).

Preparations.

MISTURA GUAIACI. Guaiacum Mixture.

Guaiacum Resin, ½ oz.; Refined Sugar, ½ oz.; Tragacanth, in powder, 35 grains; mix these together intimately, then add gradually 20 fl. oz. of Cinnamon Water. (1 in 40)

Tragacanth now used instead of Gum Acacia. As stated in previous editions of the *Companion*, not only does Tragacanth give a more diffusible mixture, but the colour does not change so rapidly, nor to the same extent as it does when Acacia is used.

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.

TINCTURA GUAIACI AMMONIATA. Ammoniated Tincture of Guaiacum.

Add 4 oz. of Guaiacum Resin in powder to 1½ fl. oz. of Strong Solution of Ammonia, mixed with 16 fl. oz. of Alcohol (90 p.c.). After 48 hours, with occasional agitation, filter and add 30 minims of Oil of Nutmeg and 20 minims of Oil of Lemon. Wash the filter with Alcohol (90 p.c.) to make 20 fl. oz. of total product. (1 in 5)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in U.S., 1 in 5 of Aromatic Spirit of Ammonia; Swed., Guaiacum Resin 3, Aqua Ammoniæ (sp. gr. 0·960) 5, and Spirit 10; Port., Guaiacum Resin 3, Liquid Ammonia (sp. gr. 0·916) 3, Spirit 14; by weight. Not in the others.

Tests.—Ammoniated Tincture of Guaiacum has a sp. gr. of 0·895 to 0·900; contains about 15 p.c. w/v of total solids and about 70 p.c. w/v of Absolute Alcohol.

TROCHISCUS GUAIACI RESINÆ. Guaiacum Resin Lozenge.
3 grains of Guaiacum Resin in each, with Fruit Basis.

Not Official.

CONFECTIO GUAIACI COMPOSITA (*Syn.* 'Chelsea Pensioner').—Guaiacum, in powder, 1; Rhubarb, 2; Bitartrate of Potassium, 8; Sulphur, 16; one Nutmeg; Honey, 96 or *q.s.—Pharm. Form.*

Guaiacum Resin, 1; Rhubarb, in powder, 2; Acid Potassium Tartrate, 7½; Nutmeg, in powder, 1; Sublimed Sulphur, 14½; Clarified Honey, 74.—*B.P.C.*

Guaiacum Resin, in powder, ½ oz.; Mustard, 1 oz.; Potassium Nitrate, in powder, ¼ oz.; Rhubarb Root, in powder, ¼ oz.; Sublimed Sulphur, 1 oz.; Treacle, to 16 oz. Dose.—1 drm.—*London.*

PULVIS GUAIACI COMPOSITUS ('Chelsea Pensioner').—Powdered Guaiacum Resin, Precipitated Sulphur, Heavy Magnesium Carbonate, Gum Acacia, Potassium Bicarbonate, of each equal parts. Dose.—20 to 40 grains.—*St. George's.*

TINCTURA GUAIACI.—Guaiacum Resin, 1; Alcohol (90 p.c.), 5.

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in Austr., Hung. and U.S. (Resin), 1 in 5; Jap., Port. and Swiss (Wood), 1 in 5; Fr., 1 in 10 (Resin); all by weight except U.S. Not in the others.

Along with Ozonic Ether it is employed as a test for the presence of blood.

TROCHISCUS GUAIACI.—2 grains of Guaiacum Resin in each with Black Currant Paste.—*Throat.*

Not Official.

GUAIACOL.

A colourless, highly refractive liquid obtained by fractional distillation of Wood Creosote. It has a characteristic aromatic odour. It can also be obtained from Guaiacum Resin.

It forms the fraction of Wood Creosote (usually Beechwood) distilling between 200° and 205° C. (392° and 401° F.). Synthetic Guaiacol is described below. *Fr. Codex* (1908) describes it as in colourless rhomboid prisms, having an aromatic odour, which points to synthetic Guaiacol being intended as the official variety.

It should be preserved in well-closed glass bottles of a dark amber tint and protected as far possible from the light.

Solubility.—About 1 in 80 of Water; mixes in all proportions with Alcohol (90 p.c.), Ether, Glycerin, and the fixed Oils (Almond and Olive).

Medicinal Properties.—Antiseptic; used in place of Creosote in the internal treatment of phthisis, in which it is better tolerated. Also given in Olive Oil as an intralaryngeal injection. Has also been used in erysipelas, neuralgia, painful rheumatic joint affections, sciatica, orchitis, and pleurisy. Disadvantages from continued use are great exhaustion and profuse diaphoresis. Applied externally is antipyretic and analgesic.

Hypodermic injection of Guaiacol (undiluted) in phthisis.—*B.M.J.* '96, i. 586.

Large doses (60 minims) in phthisis without toxic effects.—*L.* '98, i. 993.

A 10 to 20 p.c. Ointment made with a Lanolin or Vaseline basis, in gonorrhœal epididymitis.—*T.G.* '00, 145; *B.M.J.E.* '00 i. 92; '02, ii. 20.

Guaiacol vapour baths in bronchiectasis.—*L.* '99, ii. 210.

Guaiacol (or the carbonate) of much service in tuberculous cystitis.—*T.G.* '07, 313.

Dose.—1 to 5 minims = 0·06 to 0·3 c.c.

Prescribing Notes.—*It is generally given (mixed with Almond Oil) in* **capsules,** *but it has also been given in* **Mixtures** *with Glycerin and Water, and flavoured with either Compound Tincture of Lavender, Oil of Cinnamon, or Compound Tincture of Gentian. But it can be treated in the same way as Creosote both as regards Mixtures and Pills.*

Foreign Pharmacopœias.—Official in Belg., Dutch, Fr. (Gaiacol), Ital., Jap., Russ., Span., Swiss and U.S. Not in the others.

Tests.—Guaiacol has a sp. gr. of 1·116 to 1·120. It boils at 205° C. (401° F.) and distils between 200° and 205° C. (392 and 401° F.). *Fr. Codex* (1908) gives the sp. gr. at 15° C. (59° F.) as 1·143, and the boiling point 205° C. (401° F.). It is optically inactive. A drop of Ferric Chloride T.S. added to a 1 in 100 solution in Alcohol (90 p.c.) produces a blue colour fading to green. It dissolves in twice its volume of Potassium Hydroxide Solution (15 p.c.) on heating without material change in colour, and when cooled the mixture sets to a nearly white mass, which forms a clear solution with 20 volumes of Water.

The more generally occurring impurities are oily hydrocarbons, Creosote and Phenol. As a general test for impurities, the sample may be shaken with twice its volume of Petroleum Ether; the mixture should separate into two clear layers, any turbidity or failure to separate may be taken as an indication of the presence of impurities. In the same way a coloured solution or failure to set to a solid mass when examined by the Potassium Hydroxide Solution test described above, also indicates the presence of impurities. The failure of the solid mass to produce a clear solution with 20 times its volume of Water indicates the presence of oily hydrocarbons. Creosote may be detected by the reddish colour produced when the specimen is treated with 10 times its volume of Sulphuric Acid. Guaiacol develops a pure yellowish colour. It should leave no residue on volatilisation.

NEBULA GUAIACOL ET MENTHOL.—Guaiacol, 10 minims; Menthol, 60 grains; Paraffin Liquid, to 1 fl. oz.—*A. Ph. F.*

Guaiacol, 2; Menthol, 4; Liquid Paraffin, *q.s.* to produce 100.—*B.P.C.*

VASOLIMENTUM GUAIACOLI. — Guaiacol, 20; Liquid Vasoliment, 80.—*Hager.*

Parogen Guaiacolis. *Syn.* Guaiacol Vasoliment.—Guaiacol, 20; Parogen, 80.—*B.P.C.*

GUAIACOL (Synthetic) $C_7H_8O_2$, eq. 123·13. A crystalline substance which melts at about 28° C. (82·4° F.), but frequently remains liquid much below this temperature. It is said to yield more uniform results than the ordinary medicinal liquid Guaiacol, which is not so definite in composition. Soluble 1 in 50 of Water.

It should be kept in well-closed glass bottles of a dark amber tint and protected as far as possible from the light.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

Tests.—Synthetic Guaiacol melts at 28° C. (82·4° F.), and when melted should answer the tests and be free from the impurities mentioned under Guaiacol.

GUAIACOL BENZOATE. Benzosol. $C_7H_7O \cdot C_7H_5O_2$, eq. 226·38.—A white crystalline powder, having an aromatic taste and odour. It contains theoretically 54·39 p.c. of Guaiacol. Almost insoluble in Water. A non-irritating form of Guaiacol, recommended in phthisis and in diabetes.—*M.P.* '94, i. 269; *L.* '96, ii. 551.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme; usually given in **cachets** or **tablets.**

Tests.—Guaiacol Benzoate melts at about 56° C. (132·8° F.) and when prepared from synthetic Guaiacol at 59° C. (138·2° F.). It is decomposed by Alcoholic Potassium Hydroxide Solution (Semi-normal) and may be volumetrically determined by means of this solution. A weighed quantity of 1 gramme is dissolved in 25 c.c. of Alcohol (90 p.c.) mixed with 25 c.c. of Semi-normal Volumetric Alcoholic Potassium Hydroxide Solution, and saponified under a reflux condenser. The excess of Semi-normal Alkali Solution is titrated with Semi-normal Volumetric Hydrochloric Acid Solution, and the amount of Semi-normal Volumetric Alkali Solution absorbed is calculated into Guaiacol Benzoate; 1 c.c. of Semi-normal Volumetric Potassium Hydroxide Solution is equivalent to 0·11319 gramme of the pure salt. A solution in Alcohol (90 p.c.) should yield no appreciable coloration with Ferric Chloride T.S. It leaves no weighable residue when ignited with free access of air.

GUAIACOL CAMPHORATE (Guacamphol).—Colourless needles or a white or nearly white powder, having an aromatic odour. Insoluble in Water; soluble in cold, readily soluble in hot Alcohol (90 p.c.), and in Chloroform.

Used with success in the night sweats of phthisis.—*C.D.* '01, ii. 344.

Dose.—5 grains = 0·32 gramme.

GUAIACOL CARBONATE. Duotal. $(C_7H_7O)_2CO_3$, eq. 272·05. A white crystalline powder, inodorous and tasteless. It contains theoretically 90·5 p.c. of Guaiacol.

Solubility.—Insoluble in Water; about 1 in 70 of Alcohol (90 p.c.).

A non-irritating form of Guaiacol in phthisis.—*B.M.J.E.* '92, i. 8; '93, ii. 83; '95, i. 8; *L.* '96, ii. 1374; '98 i. 222, 960.

Dose.—3 to 10 grains = 0·2 to 0·65 gramme, which may be gradually increased to 60 grains = 4 grammes.

Rheumatoid arthritis, whether acute or chronic, is of infective origin, and infection is believed to take place from the alimentary tract. Intestinal antiseptics, *e.g.*, Guaiacol Carbonate, are stated to possess a high value. The great value of the drug is corroborated, but not attributed to its antiseptic action in the intestine.—*L.* '05, i. 718.

It has the advantage of being less disagreeable than Creosote, and practically tasteless, but is much more expensive.—*Edin. Med. Jour.* '05, 463.

The most convenient form of administering Guaiacol is the Carbonate in cachets. In rheumatoid arthritis, at first from 5 to 10 grains should be given three times a day, and the dose should be increased by 1 to 2 grains each week until from 15 to 20 grains are being taken in each dose. It is essential that this treatment should be continued for at least twelve months. The beneficial effects of the Guaiacol are very much increased by administering at the same time a mixture containing Potassium Iodide; the depressing effect of the Iodide should be counteracted by its combination with tonics.—A. P. Luff, *B.M.J.* '07, ii. 1143.

Foreign Pharmacopœias.—Official in Austr., Belg., Fr., Ital., Jap., Russ., Swiss and U.S.

Tests.—Guaiacol Carbonate melts at about 84° C. (183·2° F.). When heated with Alcoholic Potassium Hydroxide Solution (about 3 p.c. w/v) it is decomposed, yielding Guaiacol when the liquid is acidified. No bluish-green coloration should be produced on the addition of one or two drops of Ferric Chloride T.S. to its solution in Alcohol (90 p.c.). It should leave no weighable residue on ignition.

GUAIACOL CINNAMATE. Styracol. $C_7H_7O \cdot C_9H_7O_2$, eq. 252·20.—Colourless, crystalline needles, almost insoluble in Water; soluble in Alcohol (90 p.c.) and in Chloroform. It contains theoretically 48·8 p.c. of Guaiacol. Recommended in phthisis, and also in cystitis and gonorrhœa.

It is tasteless, and does not split up into its constituents until it has passed through the pylorus. Very useful where intestinal tubercle is suspected, or where there is troublesome diarrhœa. Most serviceable in large cavities, with offensive sputum and fetid breath. Appears to be more beneficial than Guaiacol. Employed in form of powder or tablets, the latter to be bitten into minute particles lest they pass through the intestine unchanged.—*F.T.* '07, 90.

Dose.—5 grains = 0·32 gramme, 3 times daily.

Tests.—Guaiacol Cinnamate melts at 130° C. (266° F.). It should yield no weighable residue when heated with free access of air.

GUAIACOL PHOSPHATE.—A white crystalline powder, insoluble in Water; soluble in Alcohol (90 p.c.) and in Chloroform.

Useful in tuberculosis and in typhoid fever.—*L.* '02, i. 1711.

Dose.—1½ to 3 grains = 0·1 to 0·2 gramme three or four times daily.

There is also a crystalline **Guaiacol Phosphite**, dose, 5 to 10 grains = 0·32 to 0·65 gramme.

GUAIACOL VALERIANATE (Geosote).—A yellowish, oily liquid, almost insoluble in Water. Used in tuberculosis, bronchial affections and diarrhœa.—*L.* '97, ii. 932; *B.M.J.E.* '98, i. 75; *P.J.* '97, i. 425.

Dose.—2 to 3 minims = 0·12 to 0·18 c.c. or more.

Tests.—Guaiacol Valerianate has a sp. gr. of about 1·037. It boils at 245° to 265° C. (473° to 509° F.). It should leave no weighable residue when ignited with free access of air.

GUAIACETIN (Sodium Pyrocatechin-monoacetate).—A white crystalline powder, having a faint odour and taste of Guaiacol. Soluble in Water; insoluble in Alcohol (90 p.c.). Recommended in tuberculosis.—*Pr.* lxii. 704.

Dose.—4 to 8 grains = 0·25 to 0·5 gramme three or four times daily.

GUAIACYL (Calcium Ortho-guaiacol-sulphite).—A greyish or greyish-mauve powder. Readily soluble in Water and in Alcohol (90 p.c.). A 5 to 10 p.c. solution is useful as a local anæsthetic.

Dose.—0·5 to 1·5 c.c. of a 5 p.c. solution; 1 c.c. of a 10 p.c. solution.

GUAIAFORM (Geoform).—A yellow or brownish-yellow, tasteless powder, insoluble in Water, soluble in Alcohol (90 p.c.), and in Ether. Stated to be a non-irritating preparation, and likely to be of use in pulmonary tuberculosis and typhoid fever. The Tannic Acid compound is known as '**Tannoguaiaform.**'—*L.* '02, i. 912; *P.J.* '02, i. 61.

THIOCOL (Potassium-Guaiacol-Sulphonate).—White, glistening crystals. Readily soluble in Water; insoluble in Alcohol (90 p.c.). Recommended in phthisis; stated not to irritate.—*L.* '99, i. 240; *B.M.J.E.* '01, i. 16; *P.J.* '01, ii. 645.

Dose.—10 to 20 grains = 0·65 to 1·3 gramme three times a day.

The somewhat bitter taste of Thiocol may be disguised by Syrup of Orange. A Syrup containing 5 grammes of Thiocol in each 100 grammes is known under the name of '**Sirolin.**'

Aphthisin is stated to be a mixture of Potassium-Guaiacol-Sulphonate and Ammonium Sulphichthyolate.—*P.J.* '02, ii. 137.

Among the various other compounds containing Guaiacol which have received attention in medical literature are: **Euguform** (Acetyl-methylene-diguaiacol), a greenish-white powder, insoluble in Water, antiseptic and anæsthetic, recommended as a dusting powder; also a 50 p.c. solution in Acetone; **Guaiacol Cacodylate,** a dangerously unstable salt, recommended subcutaneously in ½ to ⅘ grain doses in tuberculosis; **Guaikinol** (Quinine-di-bromo-guaiacolate), yellow crystals, readily soluble in Water, recommended for external use in erysipelas; **Quaiaquin** (Quinine Guaiacol-bi-sulphonate), a yellow powder, readily soluble in Water, introduced as a substitute for Guaiacol; **Guaiamar** (Glycerol-ester of Guaiacol), a white, non-hygroscopic crystalline powder, used as an antiseptic (**dose,** 5 to 10 grains); **Guaiasanol** (Diethylglycocoll-Guaiacol), a white crystalline powder, readily soluble in Water, used as an antiseptic; **Guaiacol Salol** (Guaiacol Salicylate), a white crystalline powder, insoluble in Water, soluble in Alcohol (90 p.c.), recommended in phthisis.

Not Official.

GUARANA.

The Seeds of *Paullinia Cupana*, H. B. and K., dried in the sun, and then roasted and reduced to a fine powder; this is moistened with a little Water, exposed to the night dew, and when it has become a hard paste is rolled into cylinders; these are further dried in the sun or in the chimneys of the huts. It is exported from Brazil.

True Guarana is very hard, heavy, and, when powdered, is reddish-grey, whilst the sophisticated is much lighter in colour; it contains about 4 p.c. of an alkaloid **Guaranine** (dose, 1 to 5 grains = 0·06 to 0·32 gramme), generally considered to be identical with Caffeine.

The *U.S.P.* requires that it shall yield, when assayed by the process outlined below, not less than 3·5 p.c. of its alkaloidal principles.

Medicinal Properties.—Nervine tonic. It is used chiefly for curing sick headache, but is also useful in diarrhœa, dysentery, and as a tonic and stomachic in convalescence.

Dose.—10 to 60 grains = 0·65 to 4 grammes infused in boiling Water and sweetened, and repeated if necessary in two hours.

Foreign Pharmacopœias.—Official in Austr., Hung., Ital., Mex., Port., Span., Swiss and U.S.

Tests.—Guarana is required by the *U.S.P.* to yield a definite percentage of alkaloidal principles. The following is an outline of the *U.S.P.* method of determination:—A weighed quantity of 6 grammes of the specimen in No. 60 powder is shaken in an Erlenmeyer flask, at intervals, for half an hour, with 120 c.c. of Chloroform and 6 c.c. of Ammonia Solution. The mixture is allowed to stand for four hours, and is then filtered, a measured quantity of 100 c.c. (= 5 grammes Guarana) is collected, and the Chloroform distilled off in a water-bath. The residue is dissolved in a mixture of 2 c.c. of Normal Volumetric Sulphuric Acid Solution and 20 c.c. of warm Water. The cooled liquid is filtered into a separator, the flask and filter are washed with Water and the washings transferred to the separator, 2 c.c. of Ammonia Solution added, and the alkaloids extracted by shaking the solution with 20 c.c. of Chloroform, the extraction being repeated with two separate portions each of 10 c.c. of Chloroform. The separated chloroformic solutions are mixed, the Chloroform distilled, 2 c.c. of Ether is added to the dry residue, the Ether carefully evaporated on a water-bath, and the residue dried at this temperature till constant in weight. The weight of residue multiplied by 20 gives the percentage w/w of alkaloids.

Preparations.

ELIXIR GUARANÆ.—Guarana, in No. 60 powder, 4 oz.; Light Magnesia, ½ oz.; Oil of Cinnamon, 6 minims; Syrup, 2 fl. oz.; Alcohol (60 p.c.), *q.s.* to produce 20 fl. oz.—*B.P.C. Formulary* 1901 incorporated in the *B.P.C.*

Dose.—30 to 120 minims = 1·8 to 7·1 c.c.

The *B.P.C. Supplement* has altered the Light Magnesia to 'Purified Talc or Kaolin.'

FLUIDEXTRACTUM GUARANÆ (*U.S.*).—Guarana, in No. 60 powder, percolated with Alcohol (49 p.c.), and treated in the usual manner to make 100 c.c. of Fluidextract.

Average Dose.—30 minims (about 2 c.c.).

Fluidextractum Guaranæ *U.S.P.* is required to contain 3·5 grammes of the alkaloids from Guarana in 100 c.c..

This has been incorporated in the *B.P.C. Supplement*, using Alcohol (45 p.c.).

Tests.—The *U.S.P.* method of determining the alkaloids in this Fluidextractum may be briefly outlined as follows:—A measured quantity of 5 c.c. of the Fluid Extract is well shaken in a separator with 15 c.c. of Chloroform and 1 c.c. of Ammonia Solution, the shaking being repeated with two separate portions each of 10 c.c. of Chloroform. The chloroformic liquids are separated, mixed, and evaporated to dryness. The residue is dissolved in a mixture of 2 c.c. of Normal Volumetric Sulphuric Acid Solution and 20 c.c. of warm Water. The cooled solution is transferred to a separator, the vessel and filter washed with Water, and the alkaloids are extracted from the mixed solution and washings by shaking with 20 c.c. of Chloroform and 2 c.c. of Ammonia Water. The extraction is repeated with two separate portions each of 10 c.c. of Chloroform. The separated chloroformic liquids are mixed, the Chloroform removed by evaporation, the dry residue mixed with 2 c.c. of Ether, and this in turn is carefully removed by evaporation. The residue is dried till constant in weight at the water-bath temperature, and weighed when cool. This weight, multiplied by 20, yields the percentage w/v of alkaloids in the Fluid Extract.

TINCTURA GUARANÆ.—Guarana, in fine powder, 1; Alcohol (60 p.c.), *q.s.* to produce 4.

Dose.—30 to 120 minims = 1·8 to 7·1 c.c.

This has been incorporated in the *B.P.C.*, employing Alcohol (90 p.c.); but in the *B.P.C. Supplement* this has been altered to Alcohol (60 p.c.).

Not Official.

GUMMI INDICUM.

INDIAN GUM.

A gummy exudation from the Wood of *Anogeissus latifolia*, Wall., is official in *Ind.* and *Col. Add.* for India and the Eastern Colonies, and may be there used in making the official preparations for which Gum Acacia is directed to be used, one part of the former being taken for every two parts ordered of the latter.

GUMMI RUBRUM.—*See* EUCALYPTI GUMMI.

Not Official.

GUTTA PERCHA.

Tough, somewhat flexible pieces, of a light brown or chocolate colour, which become hard and brittle on keeping, but can be softened again in warm Water.

The concrete Juice of *Dichopsis Gutta*, and of several other trees of the natural order Sapotaceæ.

It was official in *B.P.* '85, but is replaced in *B.P.* '98 by Caoutchouc, a solution of which is now used for Charta Sinapis.

Solubility.—Almost entirely soluble in Chloroform, yielding a more or less turbid solution. Entirely soluble in Oil of Turpentine, Carbon Bisulphide, and Benzol. Insoluble in Water, Alcohol, alkaline solutions, or dilute acids.

Medicinal Properties.—Used for making **splints**; as Gutta Percha **tissue** for keeping surgical dressings moist; as a **solution** for mixing with medicaments for chronic skin diseases, and applying like Collodion.

Foreign Pharmacopœias.—Official in Belg., Fr., Ger. (also Percha Lamellata), Hung., Jap. (also Gutta Percha Depurata), Port., Span., Swed. (also Gutta Percha Laminata), and Swiss, which has also Percha Lamellata.

LIQUOR GUTTA PERCHA.—Gutta Percha, in thin slices, 1; Chloroform, 8; Lead Carbonate, in fine powder, 1. Add the Gutta Percha to 6 of the Chloroform in a stoppered bottle, and shake them together frequently until solution has been effected. Then add the Lead Carbonate previously mixed with the remainder of the Chloroform, and having several times shaken the whole together, set the mixture aside, and let it remain at rest until the insoluble matter has subsided. Lastly, decant the clear liquid, and keep it in a well-stoppered bottle.—*B.P.* '85.

Traumaticine.—A solution of 1 of Gutta Percha tissue in 10 (by weight) of Chloroform. It produces a thin delicate film when painted on the skin, and causes neither tension nor pain. It is used for medicated applications.—*P.J.* (3) xiv. 341. A vehicle for the administration of Mercury in syphilis.—*L.* '94, ii. 590.

B.P.C. uses 1 of Gutta Percha in 10 of Chloroform by weight, the same as **Traumaticine,** and the directions for making the solution are those of *B.P.* '85.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Fr., Mex., Span. and Swiss, Gutta Percha 1, Chloroform 9 (by weight); all have Traumaticine either as a title or as a synonym. Jap. (Liquor Guttaperchæ) 1 and 10, with Lead Carbonate.

UNNA'S PLASTER MULLS consist of a very thin sheet of Gutta Percha coated on one side with an adhesive substance (Aluminium Oleinicum) containing one or more medicinal substances, and backed on the other side with Mull (undressed muslin).—*L.* '86, ii. 575.

Not Official.

GYNOCARDIÆ OLEUM.

Prior to 1900 it was supposed that the Chaulmoogra Oil of commerce was obtained from the seeds of Gynocardium odorata, but it was pointed out by Holmes, on the authority of Dr. Prain, that Chaulmoogra Seeds and Oil are the produce of *Taraktogenos Kurzii*, King. Power and Barrowcliff have extracted and examined the Oil from seeds of *Gynocardia odorata* supplied to them by Mr. David Hooper.

Gynocardia Oil consists, according to the above-named authors, of the glyceryl esters of the following Acids: (1) Linolic or isomerides of the same series, (2) Palmitic Acid in considerable amount, (3) Linolenic and Isolinolenic Acids, the latter preponderating, and (4) Oleic Acid in relatively small amount. The seeds also contain 5 p.c. of a crystalline glucoside, Gynocardin ($C_{13}H_{19}O_{9}N$, $1\frac{1}{2}H_2O$, eq. 357·51) and a hydrolytic Enzyme, Gynocardase.

Tests.—Gynocardia Oil has, according to Power and Barrowcliff, a sp. gr. of 0·925 at 25° C. (77° F.). It is optically inactive. It has an Acid value of 4·9, a Saponification value of 197·0, and an Iodine value of 152·8. The oil extracted from the seeds by Ether has a sp. gr. of 0·927 at 25° C. (77° F.); an Acid value of 5; a Saponification value of 199·6; and an Iodine value of 152.

CHAULMOOGRA OIL.—Chaulmoogra Oil of commerce is obtained from the Seeds of *Taraktogenos Kurzii*, King, a plant which is a native of Burma. The shells, which were separated from the fresh Chaulmoogra seeds by Power and Gornall, represented 34 p.c. of their weight; the kernels yielded, by expression, an amount of fixed oil corresponding with 30·9 p.c. of the entire seeds. A portion of the kernels, when completely extracted with Ether, yielded 55 p.c. of their weight of fixed oil, corresponding with 38·1 p.c. of the entire seed (having 30·7 p.c. of shells). It is a soft solid, having a faintly yellow colour and a characteristic odour.

The Oil prepared by these authorities from the Seeds yielded, on hydrolysis, a substance having the formula and m.p. of Phytosterol, Glycerol, and a mixture of fatty acids having a m.p. of 44° to 45° C. (111·2° to 113° F.), an optical rotation in Chloroform Solution of + 52·6°, an Acid value of 215, and an Iodine value of 103·2. Palmitic and Chaulmoogric Acid were identified in this mixture.

The Oil has been long known and used in India; it has a disagreeable taste and smell, and can be readily melted by a gentle heat.

Oleum Gynocardiæ is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies, with the synonym Chaulmoogra Oil.

Medicinal Properties.—Recommended in leprosy; also as an external application in psoriasis, obstinate eczema, and other skin diseases, chronic rheumatism and gout, and in phthisis.

In leprosy.—*B.M.J.E.* '93, ii. 4; '01, ii. 79; *L.* '07, ii. 1515.

4 minims in capsule three times daily in leprosy, dose increased until 50 capsules per diem were taken.—*L.* '02, ii. 1196.

Dose.—5 to 10 minims = 0·3 to 0·6 c.c., gradually increased to 30 to 60 minims = 1·8 to 3·6 c.c. three or four times a day; should be given after meals in Milk or emulsion with Gum Acacia, or better still in **capsules.**

Tests.—The Oil has, according to the above-named authors, a sp. gr. of 0·951 at 25° C. (77° F.), or of 0·940 at 45° C. (113° F.). It is dextrogyrate, the optical rotation being + 52° in a tube of 100 mm. The m.p. is 22° to 23° C. (71·6° to 73·4° F.). It has an Acid value of 23·9, a Saponification value of 213·0, and an Iodine value of 103·2.

The Ether-extracted oil has a sp. gr. of 0·952 at 25° C. (77° F.), or of 0·942 at 45° C. (113° F.). It is dextrogyrate, the optical rotation being + 51·3° in a tube of 100 mm. The m.p. is 22° to 23° C. (71·6° to 73·4° F.). It has an Acid value of 9·5; a Saponification value of 208; and an Iodine value of 104·4.

A specimen of Chaulmoogra Oil, which had been in stock for some considerable time, examined in the author's laboratory, gave an Acid value of 29·4, an Ester value of 168, a Saponification value of 197·4, and an Iodine value of 99·06; the oil yielded 99·56 p.c. of fatty acids, having a combining weight of 288.

Chaulmoogric Acid ($C_{18}H_{32}O_2$, eq. 214·38), isolated by Power and Gornall from the Chaulmoogra Oil described above, has a m.p. of 68° C. (154·4° F.). It is dextrogyrate, the optical rotation being + 56°. It is readily oxidised by cold Potassium Permanganate or by Nitric Acid. It is also readily attacked by concentrated Sulphuric Acid, with much decomposition and the evolution of Sulphur Dioxide.

Magnesium Gynocardate.—A granular powder.

Dose.—1 to 3 grains = 0·06 to 0·2 gramme.

UNGUENTUM GYNOCARDIÆ (*Ind.* and *Col. Add.*).—A 10 p.c. Ointment of Gynocardia Oil in a mixture of 4 of Hard and 5 of Soft Paraffin.

For India and the Eastern Colonies.

HÆMATOXYLI LIGNUM.

LOGWOOD.

FR., BOIS DE CAMPÊCHE; GER., BLAUHOLZ; ITAL., CAMPEGGIO; SPAN., PALO DE CAMPECHÉ.

The Heart-wood of the trunk of *Hæmatoxylon Campechianum*, L.

Imported from Campeachy in Central America, from Honduras and Jamaica, that from Campeachy being the most valuable.

Medicinal Properties.—Astringent, without irritating properties, useful in diarrhœa of phthisis and chronic diarrhœa and dysentery, and in passive hæmorrhages; in infantile diarrhœa; it does not tend to cause subsequent constipation. Also as an injection for leucorrhœa. It colours the urine and fæces dark red.

Incompatibles.—Mineral Acids, metallic salts, Lime Water, Tartar Emetic.

Official Preparation.—Decoctum Hæmatoxyli.

Not Official.—Extractum Hæmatoxyli, Extractum Hæmatoxyli Liquidum, Hæmatoxylin, and Hæmatein.

Foreign Pharmacopœias.—Official in Austr., Mex. (Palo de Campeche), Port. (Campeche), U.S. Not in the others.

Descriptive Notes.—Logwood consists of the heart-wood of the trunk of *Hæmatoxylon Campechianum*, a leguminous tree indigenous in Central America. There are several varieties of the tree, four being recognised in Honduras and three in Jamaica, the wood of which varies in tinctorial power. The kinds imported from Campeachy and San Domingo are considered the best. The heart-wood of the tree only is used, the bark and sapwood being removed. It is imported in logs about 3 feet long, externally often dark purplish-red, and reddish or orange-brown internally. In retail commerce it is sold in chips or, more rarely, in coarse powder, and for dyeing purposes is usually fermented from four to six weeks by moistening it and exposing it to the air. During this process the Hæmatoxylin, which in the pure state is colourless, becomes oxidised in the presence of atmospheric Ammonia to Hæmatein, the presence of which is recognised by the bronzy-green iridescence observable on the surface of the chips. The unfermented wood is official for use in medicine, and is described as being purplish-red externally, and internally reddish-brown with medullary rays 4 cells wide (*U.S.P.*). When chewed it colours the saliva pink. It should have a slight, agreeable odour and a sweetish, astringent taste. The odour recalls that of violets, and is perceptible in the decoction. The wood contains about 9 to 12 p.c. of Hæmatoxylin. An extract of Logwood is prepared for technical purposes which resembles Kino in appearance, but is easily distinguished by its sweet taste. The only wood with which it is likely to be confounded is Brazil wood, which gives a red, not blue, colour with alkalis, and gives Picric Acid when boiled with Nitric Acid, whilst Logwood gives only Oxalic Acid.

See also *P.J.* (4) vi. 284.

Tests.—Hæmatoxylin Wood when ignited with free access of air should not leave more than 2 p.c. of ash.

Preparation.

DECOCTUM HÆMATOXYLI. Decoction of Logwood.

Boil 1 oz. of Logwood, in chips, with 24 fl. oz. of Distilled Water, adding 70 grains of bruised Cinnamon Bark towards the end of the process; strain, and wash with Distilled Water to make 20 fl. oz. (1 in 20)

Iron vessels should not be used.

Dose.—½ to 2 fl. oz. = 14·2 to 56·8 c.c.

Not Official.

EXTRACTUM HÆMATOXYLI (*B.P.* 1885).—Logwood, in fine chips, 1; boiling Distilled Water, 10; infuse 24 hours, boil to 5, strain and evaporate to dryness by a water-bath, stirring with a wooden spatula. Iron vessels should not be used.

Dose.—10 to 30 grains = 0·65 to 1·94 gramme.

This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in U.S. Not in the others.

EXTRACTUM HÆMATOXYLI LIQUIDUM.—Boil 20 of *Unfermented* Logwood, in No. 16 powder with 40 of Distilled Water for half an hour, and strain; repeat the process with 40 more of Water, and again for the third time, and having mixed the strained liquors, evaporate over a water-bath (or preferably *in vacuo*) to the measure of 17 and add 3 of Alcohol (90 p.c.); allow it to settle for a week, then draw off the clear liquor from the sediment.

Dose.—30 to 120 minims = 1·8 to 7·1 c.c.

The above *B.P.C. Formulary* 1901 general process has been incorporated in the *B.P.C.*, except that Logwood is in No. 20 powder instead of No. 16, and the product is made up to a volume of 1 in 1.

HÆMATOXYLIN. $C_{16}H_{14}O_6$, eq. 299·84.—Bright yellow prismatic or granular crystals, sometimes brownish externally. It possesses a sweet taste somewhat resembling Liquorice. The prismatic crystals contain 3 molecules of Water of crystallisation, the granular crystals 1 molecule. Sparingly soluble in cold Water, readily in Alcohol and Ether. It is also soluble in solutions of the fixed and volatile alkalis with the production of solutions which rapidly acquire a purple colour. It has the characters of a weak acid, and unites with basic ions to form compounds, which are colourless when perfectly pure, but soon pass into strongly coloured products owing to the great avidity with which they absorb atmospheric Oxygen. Used as a nuclear stain for histological and pathological sections.

Tests.—Hæmatoxylin loses part of its Water of crystallisation at 100° C. (212° F.), but the remainder only at a higher temperature. It fuses upon further heating, about 110° to 120° C. (230° to 248° F.), and at a still higher temperature decomposes, leaving a bulky carbonaceous residue. Its solution yields with neutral or basic Lead Acetate a bluish-white precipitate, rapidly darkening when exposed to the air; with Stannous Chloride Solution a permanent rose-coloured precipitate is produced; Solution of Alum yields a bright red colour, but no immediate precipitate, and Aluminium Acetate Solution yields a fine purple. Hæmatoxylin readily reduces Chromic Acid and Potassium Bichromate, and its solution reduces both Potassio-cupric Tartrate (Fehling's) Solution and Silver Nitrate Solution.

Foreign Pharmacopœias.—Official in Belg. and Jap.

HÆMATOXYLIN SOLUTION. *See* Indicators of Neutrality.

HÆMATEIN. $C_{16}H_{12}O_6$, eq. 297·84. — A brownish-red powder sparingly soluble in cold Water; produced by the atmospheric oxidation of an ammoniacal solution of Hæmatoxylin, the Ammonium salt of Hæmatin being decomposed by

Acetic Acid. The Ammonium salt forms a deep violet crystalline powder exhibiting a metallic lustre. It is soluble in Water, the solution readily reducing Silver Nitrate Solution. It yields with Copper Sulphate Solution a violet-blue precipitate, and with Stannous Chloride Solution a violet precipitate.

Not Official.

HÆMOGLOBIN.

The substance to which in one or other of its modifications the blood owes its colour, and the chief solid constituent of the red blood corpuscles. Has been given with considerable success in the treatment of anæmia. It readily combines with free Oxygen to form **oxyhæmoglobin** or hæmato-crystallin. It has been prepared in the form of crystals, but its preparation in this form is attended with some difficulty on account of its ready solubility in Water. A colloidal form is also known as **colloidal hæmoglobin.**—*L.* '02, i. 910; *B.M.J.* '02, i. 738.

It occurs in commerce as an **Extract** (Pfeuffer's), in **Scales** (Merck) and as a dry powder, **Sanguis Bovinus Exsiccatus,** defibrinated and desiccated ox blood.

HÆMATOGEN.—An aromatic fluid preparation, stated to contain pure hæmoglobin, the salts of the blood, the albuminous constituents of the serum, and glycerin.—*L.* '99, ii. 388.

Under the name of **Sicco**, a solid preparation of hæmatogen has been introduced. It is a brownish-black powder, soluble in Water.

LIQUOR HÆMOGLOBIN CO. (Vinsip).—A fluid preparation, stated to contain hæmoglobin, and the albuminous constituents of the blood.—*L.* '01, ii. 735.

HÆMOL.—A dark brown powder, slightly soluble in Water, produced by the action of reducing substances, *e.g.*, Zinc dust, on the colouring matter of the blood.

Dose.—3 to 8 grains = 0·2 to 0·52 gramme.

Under the name of **Ferrohæmol, Cuprohæmol** and **Zincohæmol,** compounds containing respectively Iron, Copper and Zinc with Hæmol have been introduced; **Bromo-hæmol** has been used in the treatment of epilepsy.

HÆMOGALLOL.—A dark brown or reddish-brown amorphous powder, slightly soluble in Water. Produced by the action of Pyrogallol on the colouring matter of the blood.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

HAMAMELIS.

HAMAMELIS.

Both the dried Bark, and the fresh and dried Leaves of *Hamamelis Virginiana*, L., are official.

Medicinal Properties.—A local astringent and hæmostatic. Used in epistaxis, hæmatemesis, bleeding piles, and other conditions in which tannin is used.

Prescribing Notes.—*For local application,* 1 *of the Tincture is diluted with* 10 *or* 20 *of Water or the Liquor with* 1 *or* 2 *of Water. The ointment is used for piles, as is also a suppository of Hamamelin.*

When equal Volumes of Tincture of Hamamelis and Tincture of Hydrastis are mixed, a precipitation will occur unless each Tincture be mixed with an equal Volume of Glycerin.

Official Preparations.—Of the **Bark**, Tinctura Hamamelidis; of the **Dried Leaves**, Extractum Hamamelidis Liquidum; of the **Fresh Leaves**, Liquor Hamamelidis; of the **Liquid Extract**, Unguentum Hamamelidis.

Not Official.—Extractum Hamamelidis, Gossypium Hamamelidis, Pasta Hamamelidis, Suppositorium Hamamelidis, Witch Hazel Snow, and Hamamelin.

Descriptive Notes.—Hamamelis leaves are official in the *B.P.*, both fresh and dried, but in the *U.S.P.* only the dried leaves, collected in autumn. The dried leaves are more or less broken in commerce, but the fresh leaves are broadly oval, 3 to 6 inches (7 to 15 cm. long) (10 cm. *U.S.P.*), shortly stalked, cordate and unequal at the base, and sinuate at the margin, pinnately veined, paler below, with prominent veins furnished with stellate hairs, and an astringent taste, with slight bitterness. It has been found that the leaves contain more tannin in the autumn, and that the cells of the hairs have thicker walls, a dark line often marking the lining of the cell in the autumn, the walls becoming yellow, and the granular and oily contents disappearing. The odour of the distillate of the leaves is quite characteristic and is apparently the result of decomposition of the volatile oil, and is not perceptible in the dried leaves.

HAMAMELIDIS CORTEX. Hamamelis Bark. *B.P.Syn.*—Witch Hazel Bark.

The dried Bark of *Hamamelis Virginiana.*

Foreign Pharmacopœias.—Official in Mex., Span. and U.S.

Descriptive Notes.—Hamamelis Bark occurs in commerce in thin quilled pieces of pale brownish-buff or fawn colour, the outer surface or cork being thin, of a greyish tint, cracking and forming scales, and easily exfoliating, so that the inner bark, which is Cinnamon-coloured or reddish-brown, often occurs free from it in commerce. The transverse fracture is short externally, but laminated internally with weak fibres. The taste is faintly astringent and somewhat mucilaginous. Its activity is apparently due chiefly to a volatile oil, as it only contains 8 to 10 p.c. of Tannin and a small quantity of bitter principle. Hamamelis Bark is about $\frac{1}{16}$ inch (1·5 mm.) thick, *B.P.* (1 to 2 mm. *U.S.P.*); 2 to 8 inches long (0.5 to 2 dm.). The transverse section exhibits a complete ring of sclerenchymatous cells near the outer surface and numerous tangentially elongated bundles of bast fibres. Willow Bark bears some resemblance to Hamamelis Bark. It has a dull greyish-brown cork, is usually striated or wrinkled on the outer surface and does not exhibit a line of sclerenchymatous cells, and the bast fibres are much tougher than those in Hamamelis Bark; the taste also is more astringent.

Tests.—The Bark yields about 5 p.c. of ash and the amount yielded should not be much in excess of this figure.

An ash limit is stated not to be necessary for inclusion in the *B.P.*

Preparations.

TINCTURA HAMAMELIDIS. Tincture of Hamamelis.

2 of Hamamelis Bark, percolated with Alcohol (45 p.c.) to yield 20.
(1 in 10)

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Fr., 1 in 5 from leaves prepared with Alcohol (60 p.c.); Mex., 1 in 5, and Span., Bark 1 and Leaves, 1 in 20.

Tests.—Tincture of Hamamelis has a sp. gr. of 0·950 to 0·955; contains about 2·0 p.c. w/v of total solids and about 49·0 p.c. v/v of Absolute Alcohol.

Not Official.

EXTRACTUM HAMAMELIDIS.—Hamamelis Bark in powder, percolated with Alcohol (60 p.c.) and the percolate evaporated to the consistence of an extract.

Yield of Extract, 20 to 25 p.c.

Dose.—½ to 2 grains = 0·032 to 0·13 gramme in **pill.**

1½ grains = 0·1 gramme, in **suppositories**; 1 drm. in 7 drm. of Soft Paraffin or other diluent, for an **ointment.**

B.P.C. employs Alcohol (45 p.c.) and evaporates to dryness and powders it.

Official in Mex.

GOSSYPIUM HAMAMELIDIS.—Tincture of Hamamelis ½ fl. oz., Glycerin 10 minims, Cotton-Wool, in a thin sheet, 60 grains. Mix the Tincture and Glycerin, and saturate the wool evenly with the mixture. Dry by exposure to the air. Astringent and sedative.

SUPPOSITORIUM HAMAMELIDIS.—Extract of Hamamelis, 1½ grain; Oil of Theobroma, 15 grains.—*Samaritan.*

HAMAMELIN.—A powdered extractive prepared from either the Leaves or the Bark of Hamamelis Virginiana.

Dose.—1 to 5 grains = 0·065 to 0·32 gramme.

Two forms of Hamamelin are known in commerce, the green powder (non-hygroscopic) prepared from the Leaves, and a chocolate brown hygroscopic amorphous powder prepared from the Bark.

Hamamelin prepared from the Leaves with strong Alcohol was far more efficacious in suppositories than the resinoid from the Bark.—*C.D.* '98, i. 86; *P.J.* '01, ii. 231.

HAMAMELIDIS FOLIA. HAMAMELIS LEAVES. *B.P.Syn.*—WITCH HAZEL LEAVES.

The Leaves, fresh and dried, of *Hamamelis Virginiana.*

Foreign Pharmacopœias.—Official in Austr., Belg., Fr., Jap., Mex., Norw., Span., Swed., Swiss and U.S.

Tests.—The Leaves yield from 5 to 8 p.c. of ash. The inclusion of an ash limit in the *B.P.* is stated not to be a necessity.

Preparations.

EXTRACTUM HAMAMELIDIS LIQUIDUM. LIQUID EXTRACT OF HAMAMELIS.

20 of Hamamelis Leaves, percolated with Alcohol (45 p.c.) until exhausted, the first 17 reserved and the remainder evaporated to an Extract, which is dissolved in the first portion, and made up with Alcohol (45 p.c.) to 20. (1 in 1)

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Foreign Pharmacopœias.—Official in Austr., to yield not less than 23 p.c. residue; Belg., to yield 23 p.c. residue; Fr., Jap., Norw., Span., Swed., Swiss and U.S., all 1 in 1.

Tests.—Liquid Extract of Hamamelis has a sp. gr. of 1·025 to 1·050; contains about 21 p.c. w/v of total solids and about 32 p.c. w/v of Absolute Alcohol.

LIQUOR HAMAMELIDIS. Solution of Hamamelis. Ext. Hamamelidis Dest.

Fresh Hamamelis Leaves, 50; Water 100; Alcohol (90 p.c.), 10. Macerate in a still for 24 hours; then distil one half.

It probably owes its virtues to the presence of a small quantity of essential Oil.

Pond's Extract and Hazeline are products distilled from Hamamelis. **Official in** U.S.

Tests.—The Liquor has a sp. gr. of 0·980 to 0·985; it contains about 16 p.c. w/v of Absolute Alcohol.

UNGUENTUM HAMAMELIDIS. Hamamelis Ointment.

Liquid Extract of Hamamelis, ¼; Hydrous Wool Fat, 2¼. (1 in 10)

Now made with Hydrous Wool Fat in place of simple Ointment.

Not Official.

WITCH HAZEL SNOW.—Melt 2 oz. of Stearic Acid and add it to a hot solution of Glycerin 2 fl. drm., Sodium Carbonate 180 grains, in Water 10 fl. oz. After heating the mixture for one hour on a water-bath, make up the volume with Water to 10 fl. oz. and add Liquor Hamamelidis 10 fl. oz. Transfer to a hot mortar and agitate very thoroughly with an egg-whisk. Continue agitation till quite thick. Let stand 12 hours, stir well and bottle.—*P.J.* '06, i. 337.

This has been incorporated in the *B.P.C.* as follows:—

Pasta Hamamelidis. *Syn.* Witch Hazel Snow or Foam.—Stearic Acid, 10; Sodium Carbonate, 1·50; Glycerin, 1·50; Solution of Hamamelis, by weight, 50; Distilled Water, *q.s.* to produce by weight 100.

Directions for preparing are the same as **Witch Hazel Snow** given above.

Not Official.

HELLEBORUS.

CHRISTMAS ROSE.

The Rhizome and Rootlets of *Helleborus Niger*, L.

It contains the glucosides Helleborein and Helleborin.—*J.C.S. Abs.* '98, i. 39.

(It may be noted that 'White Hellebore' is Veratrum Album, and 'Green Hellebore' is Veratrum Viride.)

Medicinal Properties.—A hydragogue cathartic and emmenagogue. Poisonous in large doses, producing gastro-intestinal inflammation.

Foreign Pharmacopœias.—Official in Mex. (Eleboro) and Port. Not in the others.

TINCTURA HELLEBORI.—Hellebore Root, 1; percolated with Alcohol (60 p.c.) to yield 8. (1 in 8)

Dose.—20 to 60 minims = 1·2 to 3·6 c.c. in Water.

This has been incorporated in the *B.P.C.*

Official in Port., 1 in 5.

HEMIDESMI RADIX.

HEMIDESMUS ROOT.

The dried Root of *Hemidesmus Indicus*, R. Brown.

Imported from India.

It was brought to England by Dr. Ashburner about the year 1830, and was prescribed for the same purposes as Sarsaparilla, but it did not prove satisfactory, and is now used chiefly as a flavouring agent.

Official Preparation.—Syrupus Hemidesmi.

Descriptive Notes.—Hemidesmus Root occurs in pieces about 6 inches (15 cm.) or more in length and $\frac{1}{8}$ to $\frac{1}{2}$ inch (3 to 12 mm.) in thickness; rarely exceeding $\frac{1}{4}$ inch (6 mm.) in diameter.—*B.P.* It is cylindrical, slightly tortuous, and longitudinally furrowed, and has transverse fissures, and is of a reddish or dark brown colour, often with a violet-grey hue. On one side the cork is frequently separated and raised above the cortex. The roots are furnished with a few slender rootlets, and at the upper end with slender woody stems $\frac{3}{10}$ inch (7·5 mm.) or less thick, bearing opposite leaf scars. The root has a characteristic odour resembling that of Coumarin. Laticiferous vessels are found in the cortex, the wood is yellowish and porous, showing radiate medullary rays only in the smaller pieces, in the larger pieces the rays are visible only in the longitudinal or tangential section.

Tests.—It yields from 3 to 4 p.c. of ash.

Preparation.

SYRUPUS HEMIDESMI. SYRUP OF HEMIDESMUS.

Infuse 4 of Hemidesmus Root in 20 of boiling Distilled Water for 4 hours; strain, and after standing, decant the clear fluid, in which dissolve 28 of Refined Sugar with a gentle heat. It should weigh 42. (about 1 in 8)

Dose.—$\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c.

HIRUDO.

THE LEECH.

FR., SANGSUE; GER., BLUTEGEL; ITAL., SANGUISUGA; SPAN., SANGUIJUELA.

1. *Sanguisuga medicinalis*, the Speckled Leech; and
2. *Sanguisuga officinalis*, the Green Leech.
3. *Hirudo quinquestriata*, the Five-Striped or Australian Leech, is official in the *Ind.* and *Col. Add.* for the Australian Colonies.

Leeches are imported chiefly from Hamburg. They are also collected in large numbers in Spain, France, Italy and Hungary.

Used for the abstraction of blood from congested parts; in pleurisy, typhlitis, pericarditis, and in cardiac distress.

When about to apply a Leech, it should be handled as little as possible, and the part of the body should be clean, and free from grease or soap, and, if a hairy part, it should be first shaved. Several suggestions have been made, in case the Leech should refuse to bite: to smear the part with Milk, Cream, or Sugar; to apply a sinapism and thoroughly clean the part afterwards; to scratch the part with a needle. When the Leech is required to bite a particular spot, it is useful to cut a small hole in blotting paper, and place it on the part.

When applying a Leech to one of the orifices of the body, the Leech should be confined in a Leech glass. Should a Leech be swallowed, a strong solution of common salt (Sodium Chloride) should be drunk.

Bleeding from Leech bites is sometimes difficult to stop. The following remedies have been applied with advantage:—Matico, Solution of Ferric Chloride, Silver Nitrate Point, saturated Solution of Alum, and pressure on the part.

Foreign Pharmacopœias.—Official in Belg., Dan., Dutch, Fr. (Sangsue), Ger., Hung., Ital., Jap. (Hirudines), Port. (Sanguesugas), Swed. and Swiss. Not in the others.

Descriptive Notes.—There are two species met with in European commerce, viz., the Speckled or German Leech (*Sanguisuga medicinalis*, Savigny) and the Green or Hungarian Leech (*S. officinalis*, Savigny), the former having the ventral surface greenish-yellow, spotted with black, and the latter the ventral surface olive green and not spotted with black. Leeches should weigh 1 to 5 grammes only. In the Australian Colonies, the Five-Striped or Australian Leech, *Hirudo quinqüestriata*, Schmarda, may be substituted for the European Leeches. It has a greenish-yellow brown dorsal surface with five longitudinal stripes, and a greenish-yellow ventral surface not spotted. Leeches should be kept in Distilled Water with a piece of charcoal in it and in the shade. After feeding, if placed in Camphor Water they will vomit the blood they have sucked, and can then be placed in clear Distilled Water, and will be ready for use again in about 10 days. The Water requires changing about once a week.

HOMATROPINÆ HYDROBROMIDUM.

HOMATROPINE HYDROBROMIDE.

HYDROBROMATE OF HOMATROPINE.—*B.P. Add.* '90.

$C_{16}H_{21}NO_3$, HBr, eq. 353·49.

FR., BROMHYDRATE D'HOMATROPINE; GER., HOMATROPINHYDROBROMID; ITAL., BROMIDRATO DI OMATROPINA.

Colourless, small, rhombic prisms, or a white crystalline, odourless powder. It is the Hydrobromide of Tropine Mandelic Acid Ester, which is a lower homologue of Atropine.

It possesses a bitter taste.

It should be kept in well-closed glass bottles of a dark amber tint and protected as far as possible from the light.

Solubility.—1 in 6 of Water; 1 in 18 of Alcohol (90 p.c.); insoluble in Ether and in Chloroform.

Medicinal Properties.—Mydriatic. Dilates the pupil as rapidly, though not so energetically as Atropine, but its effects disappear much sooner—in about a quarter of the time. When used with Cocaine the action is quicker and more powerful.

When an oily solution is required, the alkaloid (not tho salt) is dissolved in Castor Oil.

For hypodermic injection 4 grains of Homatropin Hydrobromide dissolved in 1 fl. oz. of sterilised Distilled Water, 6 minims = $\frac{1}{20}$ grain.

1 to 2 drops of a 1 p.c. solution in some cases of muscular asthenopia.—*B.M.J.* '99, ii. 765.

Dose.—$\frac{1}{80}$ to $\frac{1}{20}$ grain = 0·0008 to 0·0032 gramme.

Ph. Ger. maximum single dose, 0·001 gramme; maximum daily dose, 0·003 gramme.

Official Preparation.—Lamellæ Homatropinæ.

Not Official.—Guttæ Homatropinæ, Guttæ Homatropinæ cum Cocaina, Lamellæ Homatropinæ cum Cocaina, Homatropina, Oleum Homatropinæ cum Cocaina.

Foreign Pharmacopœias.—Official in Dutch, Ger., Ital., Jap., Swed., Swiss and U.S.

Tests.—Homatropine Hydrobromide melts at 209° to 212° C. (408·2° to 413·6° F.). Neither the *B.P.* nor the *P.G.* includes a m.p.; the *U.S.P.* gives 213·8° C. (417° F.). Its solution should be neutral in reaction towards Litmus paper. It exerts a powerful mydriatic action on the pupil of the eye. The 1 in 50 aqueous solution yields with Iodine Solution a brown precipitate; with Mercuric Chloride Test-solution a white precipitate; with Potassium Hydroxide Solution a white precipitate soluble in excess of the reagent; but no precipitate with Tannic Acid Solution or with Platinic Chloride Solution. The *P.G.* states that it also, after the addition of Hydrochloric Acid, yields no precipitate with Platinic Chloride Solution. The solution yields with Silver Nitrate Solution a yellowish curdy precipitate, readily soluble in Potassium Cyanide Solution, practically insoluble in Ammonia Solution, and insoluble in Nitric Acid. 1 c.c. of a 10 p.c. solution when cautiously mixed with Chlorine Water yields a brownish colour to Chloroform when shaken with one-fifth its volume of the latter fluid; the *U.S.P.* uses twice the volume of Chloroform. The crystalline alkaloid obtained by adding an excess of Potassium Hydroxide Solution to an aqueous solution of the salt and extracting with Ether (allowing the Ether to evaporate spontaneously), should possess a m.p. of 96° C. (204·8° F.). 1 centigramme of the salt mixed with a few drops of Fuming Nitric Acid, and evaporated to dryness on a water-bath, leaves a yellowish residue, which, when cool, yields on the addition of a freshly-prepared Alcoholic Potassium Hydroxide Solution a reddish-violet colour. The *U.S.P.* states that the salt yields an evanescent pink colour, changing rapidly to green when mixed with Sulphuric Acid containing a crystal of Potassium Bichromate.

The more generally occurring impurities are alkaloids other than Homatropine (Atropine, Hyoscyamine, and Hyoscine), and mineral matter. The *B.P.* states that a 2 p.c. aqueous solution yields no precipitate on the cautious addition of Ammonia Solution previously diluted with twice its volume of Water. A 2 p.c. solution of Atropine Sulphate with Ammonia Solution under these conditions gives a distinct turbidity, but with Hyoscyamine and Hyoscine Hydrobromides no reaction is visible. A 1 p.c. solution of Atropine Sulphate remains unchanged. Most alkaloids other than Atropine and Hyoscyamine may be detected by the Ammonia and Mercuric Chloride Test described below. Any salt of Atropine or Hyoscyamine under exactly similar conditions will give the same reaction, but with Hyoscine no formation of Mercuric Oxide appears to take place. The most characteristic test for Homatropine is that described above, with Fuming Nitric Acid and Alcoholic Potassium Hydroxide Solution. It distinguishes it from Atropine, the latter giving a deep purple coloration, as do also Hyoscyamine and Hyoscine, but in the case of the two latter, the coloration is less intense and more transient. It should leave no weighable residue when ignited with free access of air, any residue indicating mineral impurity.

Ammonia and Mercuric Chloride.—If 1 c.c. of a 1 in 100 aqueous solution of the salt (0·01 gramme of the Salt, *B.P.*) be made alkaline with Ammonia Water, shaken out with Chloroform, and the chloroformic solution evaporated to dryness, the residue should turn yellow, and finally brick-red, when warmed with about 1·5 c.c. of a solution made by dissolving 1 part of Mercuric Chloride in 50 parts of a mixture of Alcohol, 5 volumes, and Water, 3 volumes; indicating the absence of most other alkaloids except Atropine and Hyoscyamine, *U.S.P.* and *B.P.*

Platinic Chloride.—An aqueous solution of the salt is not precipitated by T.S. of Platinic Chloride, *U.S.P.*; after the addition of Hydrochloric Acid, *P.G.*

Nitric Acid and Alcoholic Potassium Hydroxide Solution.—If 0·01 gramme of the salt be added to 5 drops of Nitric Acid and evaporated to dryness in a porcelain dish, the residue should not acquire a violet colour upon the addition of a few drops of Alcoholic T.S. of Potassium Hydroxide, *U.S.P.*; 0·01 gramme evaporated with 5 drops of Fuming Nitric Acid in a porcelain dish on a water-bath leaves a faint yellow residue which, on cooling and adding Alcoholic Solution of Potassium Hydroxide, assumes a transient violet colour, quickly becoming reddish-yellow.

Preparation.

LAMELLÆ HOMATROPINÆ. Discs of Homatropine.

Discs of Gelatin and Glycerin, each weighing about $\frac{1}{50}$ grain = 0·0013 gramme; and containing $\frac{1}{100}$ grain = 0·00065 gramme of Homatropine Hydrobromide.

Not Official.

GUTTÆ HOMATROPINÆ.—Homatropine Hydrobromide, 4 grains; Distilled Water, 1 fl. oz.—*London Ophthalmic* and *Guy's.*

GUTTÆ HOMATROPINÆ CUM COCAINA.—Homatropine Hydrobromide, 4 grains; Cocaine Hydrochloride, 10 grains; Distilled Water, 1 fl. oz.—*London Ophthalmic.*

Homatropine Hydrobromide, 7 grains; Cocaine Hydrochloride, 10 grains; Boric Acid, 5 grains; Distilled Water, 1 fl. oz.—*Westminster Ophthalmic.*

LAMELLÆ HOMATROPINÆ CUM COCAINA.—Each disc contains $\frac{1}{50}$ grain of Homatropine Hydrobromide, and $\frac{1}{50}$ grain of Cocaine Hydrochloride. —*London Ophthalmic.*

HOMATROPINA.—Colourless crystals, not deliquescent, nearly insoluble in Water, but soluble 1 in 80 of Olive Oil, 1 in 20 of Castor Oil. They combine readily with Oleic Acid.

Used in cases where an oily preparation or an ointment is required.

Foreign Pharmacopœias.—Official in Mex.

Homatropine Hydrochloride and **Salicylate** form colourless crystals or white crystalline powders. Both salts are readily soluble in Water, and in Alcohol (90 p.c.).

OLEUM HOMATROPINÆ CUM COCAINA.—Homatropine, pure, 10 grains; Cocaine (alkaloid), 10 grains; Castor Oil, 1 fl. oz. Heat together till dissolved.—*London Ophthalmic.*

Not Official.

HORDEUM DECORTICATUM.

PEARL BARLEY.

The dried Seed of *Hordeum distichum*, L. divested of its early integuments; from plants cultivated in Britain.

Foreign Pharmacopœias.—Official in Fr. (Orge Perlé), Port. (Cevada Santa), Mex. and Span. (Cebada). Not in the others.

DECOCTUM HORDEI.—Pearl Barley, 1; wash the Barley with cold Water, and reject the washings; boil the washed Barley with 15 of Distilled Water for 20 minutes in a covered vessel, and strain. Product about 10. (about 1 in 10)

This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in Fr. (Tisane d'Orge), 1 in 50. Not in the others. Decoctum Hordei Compositum, 1 in 50 is official in Span.

Medicinal Properties.—Nutritive and demulcent, used in catarrhal conditions of the respiratory and urinary systems; as a drink in febrile diseases, and to dilute cow's Milk for feeding children, thus forming a more easily digested curd.

Dose.—1 to 4 fl. oz. = 28·4 to 113·6 c.c.

DECOCTUM HORDEI TARTARISATUM.—Acid Potassium Tartrate, 80 grains; the Peel of ½ Lemon; Sugar, 2½ oz.; Decoction of Barley, 40 oz.; boil and strain.—*St. George's.*

HYDRARGYRUM.

MERCURY.

Hg, eq. 198·80.

Fr., Mercure Purifié; Ger., Quecksilber; Ital., Mercurio; Span., Mercurio.

A shining, silver-white, metallic-looking fluid obtained from native Mercuric Sulphide.

It should be kept in strong, well-closed bottles.

Solubility.—Insoluble in the usual solvents; insoluble in Hydrochloric Acid, insoluble in cold Sulphuric Acid, but dissolved by hot Sulphuric Acid with evolution of Sulphur Dioxide. It dissolves readily and completely in Nitric Acid.

Medicinal Properties.—Mercury as a metal is seldom given alone. In a state of minute sub-division with Chalk, or in pill form, however, it has the effect of increasing the various secretions, and is itself absorbed by all the tissues of the body. It is an alterative, indirect cholagogue, purgative, diuretic, and a glandular stimulant. When given as a purgative it is usually combined with other purgatives, or followed by a purgative saline.

Of great use, internally, in primary and secondary, and with Iodides in tertiary syphilis, but the doses should not be such as to cause salivation.

Externally, by means of the **ointment, oleate** or **liniment,** in syphilis, in parasitic skin diseases, and as a stimulant in chronic synovitis, peritonitis and other chronic inflammations, and glandular enlargements.

See also under the various salts of Mercury.

Two cases of acute intestinal obstruction successfully treated with Quicksilver.—*B.M.J.* '02, i. 1023.

Of the drugs frequently used in the treatment of syphilis, Blue Ointment is regarded as of most value.—*L.* '01, ii. 1038.

As an inunction (½ to 1 drm. of the ointment well rubbed in at night before bedtime) it forms one of the most satisfactory ways of exhibiting Mercury.—*B.M.J.* '00, ii. 1762.

A mercurial cream prepared with a Lanolin basis, and containing Carbolic Acid for use as an intramuscular injection in the treatment of syphilis.—*B.M.J.* '03, i. 1258.

Metallic Mercury still continues to be largely used in the treatment of syphilis, and preparations for use as inunctions or for intramuscular injection are in good demand. For intramuscular injection in the treatment of syphilis a preparation made according to the following formula is stated (*M.P.* '06, i. 149) to be useful:—Purified Mercury, 40 grammes; anhydrous sterilised Lanolin, 12 grammes; white sterilised Vaseline, 13 grammes; sterilised liquid Vaseline, 35 grammes. One c.c. contains ½ gramme Mercury. The average dose is 7 or 8 centigrammes.

The administration of Mercury internally is stated (*B.M.J.* '05, i. 700) to be specially apt to cause symptoms of poisoning when combined with the extensive use of Tar externally.

Of the numerous salts and preparations of Mercury which have from time to time been recommended in the treatment of syphilis, attention still seems to centre round those preparations partaking of the nature of an ointment, and which can be used by inunction. In the *L.* '04, ii. 1405, 15 grains Ung. Hydrarg. are recommended to be gently rubbed over the abdomen or the inside of the thigh or arm at night, and then covered with a flannel bandage until the following morning, when it is washed off, and this treatment is repeated unless the skin shows signs of irritation.

0·05 cm. of a mixture of two parts of metallic Mercury, one part each of Lanolin and liquid Paraffin, has been recommended (*B.M.J.* '04, ii. 1702) for subcutaneous injection. Intramuscular or intravenous injections unsuitable in infants, owing to the pain and the risk of inflammation (*L.* '04, ii. 1405).

A cream containing Mercury, Lanolin and Carbolised Soft Paraffin (white) is used in the Royal Navy.—*B.M.J.* '07, ii. 512.

Official Preparations.—Emplastrum Ammoniaci cum Hydrargyro, Emplastrum Hydrargyri, Hydrargyrum cum Creta, Liquor Hydrargyri Nitratis Acidus, Linimentum Hydrargyri, Pilula Hydrargyri, Unguentum Hydrargyri, Unguentum Hydrargyri Compositum, and Unguentum Hydrargyri Nitratis.

Not Official.—Mercurial Cream (Squire), Mercury Plaster Mull, Mercury and Carbolic Plaster Mull, Oleum Cinereum, Parogenum Hydrargyri, Pilula Hydrargyri Carbolici, Pilula Hydrargyri cum Opio, Pilula Hydrargyri cum Rheo, Suppositoria Hydrargyri, Unguentum Hydrargyri Mitius, Unguentum Cinereum, Vasolimentum Hydrargyri, Hyrgolum, Hydrargyri Benzoas, Hydrargyrum Carbolicum, Hydrargyrol, Hermophenyl, Hydrargyri Cyanidum, Injectio Hydrargyri Cyanidi, Mercury Zinco-Cyanide, Unguentum Hydrargyri et Zinci Cyanidi, Hydrargyri Ethylenediamine Citras, Hydrargyri Gallas, Hydrargyri-Naphtholacetas, Hydrargyri Salicylas, Hydrargyri Succinimidum, Hydrargyri Sulphas, Unguentum Hydrargyri Sulphatis Flavæ, Hydrargyri Tannas, Hydrargyri Thymolacetas.

Foreign Pharmacopœias.—Official in all.

Tests.—Mercury has a sp. gr. of 13·5. It solidifies at −39·4° C. (−39° F.). It boils at 360° C. (680° F.), and volatilises slightly even at ordinary temperatures. The fully-oxidised solution in Nitric Acid, freed from excess of Nitric Acid, affords with Ammonia Solution a white precipitate, with Potassium or Sodium Hydroxide a yellow precipitate, with Potassium Iodide Solution a bright scarlet precipitate, soluble in excess of the reagent and in a considerable excess of the Mercuric salt; excess of Hydrogen Sulphide yields a black precipitate insoluble in Ammonium Hydrosulphide Solution, and in hot diluted Nitric Acid Solution. A bright piece of Copper foil immersed in the solution is coated with a grey film which, on rubbing, shows a bright silvery lustre. When the coated foil is heated in a dry clean test-tube the Mercury condenses on the sides of the tube in minute globules. The solution yields with Stannous Chloride Solution first a greyish-white precipitate of Mercurous salt and subsequently a grey precipitate of metallic Mercury. The *U.S.P.* requires that it shall contain not less than 99·9 p.c. of metallic Mercury, but gives no method of determination. It also requires that globules of Mercury dropped upon white paper should roll about freely and leave no streaks or traces. It should present a bright surface even after agitation in contact with air.

The more generally occurring impurities are foreign metals and fixed residue. More than slight traces of foreign metals may be detected by the Sodium Thiosulphate Test described below, fixed residue by the volatilisation test.

Sodium Thiosulphate.—On boiling 5 grammes of Mercury with 5 c.c. of Water and 4·5 grammes of Sodium Thiosulphate in a test-tube for about one minute, the Mercury should not lose its lustre, and should not acquire more than a slightly yellowish shade, indicating the absence of more than slight traces of foreign metals, *U.S.P.*

Volatilisation.—At a temperature of 357·25° C. (675·05° F.) it is completely volatilised, leaving no appreciable residue, *U.S.P.;* it is volatilised leaving an insignificant amount of fixed residue below visible redness, *B.P.*

Preparations.

EMPLASTRUM HYDRARGYRI. Mercurial Plaster.

3 oz. (by weight) of Mercury is rubbed with a heated mixture of 56 grains of Olive Oil, and 8 grains of Sublimed Sulphur; and finally incorporated with 6 oz. of melted Lead Plaster. (about 1 in 3)

Foreign Pharmacopœias.—Official in Austr., Belg., Fr., Ger., Hung., Ital., Jap., Norw., Russ. and Swiss, 1 in 5; Dan. and U.S., 3 in 10; Dutch, 1 in 4; Mex., 1 in 5·57; Span., 1 in 7·5; Swed., 1 in 3. The ingredients differ considerably.

EMPLASTRUM AMMONIACI CUM HYDRARGYRO. Ammoniacum and Mercury Plaster.

3 oz. (by weight) of Mercury treated as above with Olive Oil and Sulphur and mixed with 12 oz. of purified Ammoniacum.

(nearly 1 in 5)

Applied in glandular swellings, in chronic hepatic enlargement, syphilitic nodes, and in chronic synovitis.

Foreign Pharmacopœias.—Official in U.S., resembles Brit. Not in the others.

LINIMENTUM HYDRARGYRI. Liniment of Mercury.

Mix 1 oz. of Mercury Ointment with Liniment of Camphor to make 1½ fl. oz.; and add 160 minims of strong solution of Ammonia diluted with Liniment of Camphor to 1½ fl. oz.

(1 Ointment in 3, or 1 of Mercury in 6)

A stimulating Liniment, applied as an absorbent to swollen joints, or placed with Lint in the arm-pits, or rubbed into the abdominal wall in tubercular peritonitis.

PILULA HYDRARGYRI. MERCURY PILL. *B.P.Syn.*—BLUE PILL.

2 (by weight) of Mercury intimately mixed with 3 of Confection of Roses, and finally with 1 of powdered Liquorice Root. (1 in 3)

8 commercial samples examined contained 28 to 41 p.c. of Mercury, and little or no Oxide; 5 of the 8 samples were prepared with Confection of Hips.—*P.J.* (3) xv. 230.

Dose.—4 to 8 grains = 0·26 to 0·52 gramme.

Foreign Pharmacopœias.—Official in Fr., Pilules Mercurielles Simples; Jap., Mex., Pildoras Azules; Port., Pilulas Mercurials; Swed., Pilulæ Hydrargyri; U.S., Massa Hydrargyri; all 1 in 3. Not in the others.

UNGUENTUM HYDRARGYRI. MERCURY OINTMENT.

Mercury (by weight), 16; Lard, 16; Prepared Suet, 1.

(nearly 1 in 2)

Official Preparations.—Used in the preparation of Linimentum Hydrargyri and Unguentum Hydrargyri Compositum.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch and Span. (Pomada Mercurial), 3 in 10; Fr., Ital. (Pomata Mercuriale), Mex. (Unguento de Mercurio Doble), Port. and U.S., 1 in 2; Fr. has also Pommade Mercurielle Faible, 1 in 8; Ger., Hung., Jap., Russ., Swed. and Swiss (Ung. Hydr. Ciner.), 1 in 3. Span. has also Pomada Mercurial Simple, 3 in 20.

The **Brussels Conference** adopted a strength of 30 p.c. for Unguentum Hydrargyri.

Mercury, 50; Oleate of Mercury, 2; Suet, 23; Benzoinated Lard, 25.—*U.S.*

UNGUENTUM HYDRARGYRI COMPOSITUM. COMPOUND MERCURY OINTMENT.

Mercury Ointment, 10; Yellow Beeswax, 6; Olive Oil (by weight), 6; Camphor, in flowers, 3. Mix the Beeswax, Olive Oil, and Mercury Ointment with the aid of heat, add the Camphor, triturate until cold. (1 Mercury in 5)

Contains rather less Mercury Ointment than B.P. '85, and the manipulation is modified, as previously suggested in the *Companion.*

This is Scott's celebrated absorbent Ointment (**Scott's dressing**), the Soap Cerate being replaced by the Oil and Beeswax.

It is an admirable Ointment to apply to chronic joint enlargements.

Not Official.

MERCURY PLASTER MULL (*Unna*).—Containing 1 grain = 0·06 gramme of Mercury to the square inch.

MERCURY AND CARBOLIC PLASTER MULL (*Unna*).—Containing 1 grain = 0·06 gramme of Mercury and ⅜ grain = 0·02 gramme of Carbolic Acid to the square inch.

MERCURIAL CREAM (*Squire*).—Pure re-distilled Mercury, by weight, 48 grains; sterilised anhydrous Lanolin, by weight, 240 grains; pure sterilised Olive Oil, *q.s.* to produce 1 fl. oz.

10 minims = 1 grain of pure metallic Mercury.

Dose.—10 minims = 0·6 c.c. by intramuscular injection. The preparation recommended by Dr. Julius Althaus, in his paper before the International Medical Congress at its Berlin meeting in 1890, consisted of 1 part of metallic Mercury, thoroughly rubbed up with 4 parts of purest Lanolin, and then mixed with 5 parts of carbolised oil of 2 p.c. strength, 10 minims of the resultant grey cream contained 1 grain of metallic Mercury. Lang's formula, published in 1888, suggested the original principle of the process, namely the minute subdivision of the metallic Mercury by means of Lanolin, and the thinning of the emulsion with Olive Oil.

The following formula is given (*B.M.J.* '03, i. 1258) by Colonel F. J. Lambkin, R.A.M.C.—Mercury, 2 drm.; anhydrous Lanolin, 2 drm. by weight; Paroleine, 4 drm.; Carbolic Acid, 2 p.c., by measure.

Dose.—5 to 10 minims once a week as an intramuscular injection.

The two under-mentioned formulas are given by Colonel F. J. Lambkin, R.A.M.C., in *L.* '07, ii. 14.

Mercury, 10 grammes; absolute Creosote and Camphoric Acid (Creo-Camph.) of each equal parts, 20 c.c.; Palmitin Basis to 100 c.c.

Calomel, 5 grammes; absolute Creosote and Camphoric Acid (Creo-Camph.) of each equal parts, 20 c.c.; Palmitin Basis to 100 c.c.

As a basis for Calomel Injection used in Syphilis, Dr. Allaire ('Nouveaux Remèdes') recommends Palmitin prepared from palm oil. It does not become rancid, easily saponifies in the body, and is readily absorbed. A little Guaiacoloid (a combination in molecular proportions of Guaiacol and Camphor) is added to the injection.—*C.D.* '07, ii. 411.

OLEUM CINEREUM (Grey Oil).—White Vaseline, 2·5; Mercury Ointment, 1; Mercury, 19·5; triturate in a warm mortar until the Mercury is incorporated; then add White Vaseline, 7; Liquid Vaseline, 20. All by weight.

This preparation contains 40 p.c. of Mercury.—*P.J.* (3) xix. 704.

For **hypodermic injection** in syphilis. **Dose.**—1 to 2 minims.—*B.M.J.* '88, i. 1296; *T.G.* '94, 319.

A modification of 'Grey Oil,' is Mercury, 1; Lanolin anhydrous, 2; Carbolic Oil (2 p.c.), 1; all by weight. 10 minims used for each injection.—*B.M.J.* '98, i. 485.

Mercury, 40; Wool Fat, 10; Liquid Paraffin, *q.s.* to produce (by weight) 100. **Dose.**—1 to 2 minims.—*B.P.C.*

The following formula appears in the *Fr. Codex* (1908) under the title of

Huile Grise.—Purified Mercury, 40; anhydrous Lanolin, 26; Vaseline Oil (Huile de Vaseline medicinale), 60. The Lanolin and the Vaseline Oil are sterilised separately in glass flasks in an autoclave at 120° C. (248° F.) for 20 minutes. A pestle and mortar are sterilised by means of burning Alcohol, and placed therein are the Mercury, and then the Wool Fat. The metallic particles are triturated until they are extinguished, and then the Liquid Paraffin is added in small portions. The product should weigh 126 grammes, and measure 100 c.c., and therefore contains almost exactly 40 centigrammes of Mercury per c.c., or 40 p.c. w/v, and should be transferred immediately to phials of two, five, and ten c.c. capacity previously sterilised at 180° C. (356° F.).

PILULA HYDRARGYRI CUM OPIO.—Mercury Pill Mass, 5 grains; Opium, in powder, ¼ grain.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

Mercurial Pill to 3¾ grains, Opium, in powder, ¼ grain.—*Guy's.*

Mercury Pill, 5 grains; Opium, in powder, ½ grain.—*University* (No. 3) and *London Ophthalmic.*

PILULA HYDRARGYRI CUM RHEO.—Mercury Pill Mass, 2½ grains; Compound Rhubarb Pill Mass, 2½ grains.—*St. Thomas's* and *London Ophthalmic* and *King's.*

This has been incorporated in the *B.P.C.*

SUPPOSITORIA HYDRARGYRI.—Mercury Ointment, 5 grains; Oil of Theobroma, 10 grains, in each suppository.

UNGUENTUM HYDRARGYRI MITIUS.—Mercurial Ointment, 1; Lard, 2.—*P.L.* '36.

This has been incorporated in the *B.P.C.* under the title Unguentum Hydrargyri Dilutum.

Mercurial Ointment (*U.S.P.*), 67; Petrolatum, 33.—*U.S.P.*

UNGUENTUM CINEREUM.—Mercury and Lanolin, of each 1 oz.; best Olive Oil, ½ fl. oz.—*Lock.*

VASOLIMENTUM HYDRARGYRI.—Mercury, 40; Wool Fat, 20; Thick Vasoliment, 60.—*Hager.*

Parogenum Hydrargyri. *Syn.* Mercury Vasoliment.—Mercury, 30; Wool Fat, 15; Thick Parogen, 55.—*B.P.C.*

HYRGOLUM (Colloid Mercury).—Heavy black grains exhibiting a metallic lustre, containing 73 to 80 p.c. of Mercury; soluble in Water. On account of its freedom from causticity and from irritating properties, it has been suggested as an anti-syphilitic remedy in the form of a 10 p.c. ointment, or internally in ¾ grain dose in pill form.—*L.* '00, i. 1450; *B.M.J.* '01, i. 1551.

HYDRARGYRI BENZOAS. $Hg(C_7H_5O_2)_2$, eq. 439·06.—A white crystalline salt, practically insoluble in Water and in Alcohol (90 p.c.), but soluble in solutions of the Benzoates of the alkali metals. Has been used in the treatment of syphilis. The hæmostatic effects of intramuscular injections in cases of uterine hæmorrhage are stated to far surpass Ergot (*B.M.J.* '04, ii. 1085).

Mercury Benzoate, Biniodide and Lactate are employed (*M.P.* '05, ii. 622) in the treatment of syphilis in daily doses of ⅙ grain and should be sufficiently diluted (2 c.c. of Water). Mercury Salicylarsenate and Hermophenyl are generally but little painful in injections in syphilis, and are given in larger doses, *e.g.*, ½ to 1 grain. Hermophenyl may be employed in larger doses (1½ grains), but only as a weekly injection.

One centigramme (⅙ grain) Benzoate is a small daily dose in the treatment of syphilis, and 2 centigrammes daily for three weeks may be safely given (*M.P.* '06, i. 148). A good formula is Mercury Benzoate, 1 gramme; Sodium Chloride pure, ¾ gramme; Distilled Water, 100 grammes.

Six cases of general paralysis and tabes treated by hypodermic injection of 3 centigrammes Mercury Benzoate daily for 15 days alternated by a 15 days' interval.—*B.M.J.E.* '02, ii. 87.

A suitable solution (*Desesquelle* and *Bretonneau*) for hypodermic injection in syphilis, Mercuric Benzoate, 0·3 gramme; Ammonium Benzoate, 1·5 grammes; Sterilised Distilled Water, to 30 c.c.—*P.J.* '02, ii. 73.

Foreign Pharmacopœias.—Official in Fr.

Tests.—Mercuric Benzoate Solution yields the tests distinctive of Mercury given under that substance. With Ferric Chloride T.S. it yields a buff-coloured precipitate. When shaken with Water and filtered, the filtrate, when acidified with Nitric Acid, yields no precipitate or turbidity with Silver Nitrate Solution. Another portion of the filtrate, when mixed with an equal volume of Sulphuric Acid, keeping the mixture cool, should yield no brown ring at the junction of the two fluids on the careful addition of Ferrous Sulphate Solution. The Benzoic Acid obtained from the salt should possess the m.p., answer the tests distinctive of Benzoic Acid, and be free from the impurities mentioned under Acidum Benzoicum. 0·5 gramme ignited with free access of air should leave no weighable residue. It contains theoretically 45·3 p.c. of metallic Mercury.

HYDRARGYRUM CARBOLICUM (Mercury Carbolate, Mercury Phenate) (*Schadek*).—Colourless crystals, or a white powder. Obtained by precipitating an alcoholic Solution of Mercuric Chloride with an alcoholic Solution of Phenol and Potassium Hydroxide, and evaporating nearly to dryness, with subsequent washings.

Nearly insoluble in Water, and soluble with difficulty in cold Alcohol.

Medicinal Properties.—Recommended in secondary syphilis.—*L.* '87, i. 943; *L.* '87, ii. 277; *P.J.* (3) xviii. 605.

Dose.—⅓ to ½ grain = 0·02 to 0·032 gramme, three times a day in pill; also hypodermically suspended in Mucilage, strength 2 p.c.

Pilula Hydrargyri Carbolici.—Mercury Carbolate, ½ grain; Extract of Liquorice, 1 grain; Powdered Liquorice, 1 grain, in each pill.

Dose.—Two to four pills daily.

Hydrargyrol (Mercury Phenol-para-sulphonate).—Brownish-red crystalline scales or crusts. Decomposed by Water with the formation of basic salts. Insoluble in Alcohol (90 p.c.). Introduced as an antiseptic.

A combination of the above salt with Ammonium Tartrate is known under the name of '**Asterol,**' a white or reddish-white micro-crystalline powder, soluble in Water. Introduced as an antiseptic, used in the form of 2 to 5 p.c. solution.—*B.M.J.E.* '01, ii. 64; *P.J.* '99, i. 538; '99, ii. 216; *C.D.* '01, ii. 872.

Hermophenyl (Sodium Mercuro-phenol Disulphonate).—A white amorphous powder, readily soluble in Water. It contains about 40 p.c. Mercury. Introduced as an antiseptic.—*P.J.* '01, ii. 245.

HYDRARGYRI CYANIDUM. $Hg(CN)_2$, eq. 250·5.—Colourless or white prismatic crystals.

It contains theoretically 79·36 p.c. of metallic Mercury. It should be kept in well-stoppered glass bottles of a dark amber tint in a cool atmosphere and protected as far as possible from the light.

Solubility.—1 in 13 of Water; 1 in 20 of Alcohol (90 p.c.).

Medicinal Properties.—A powerful antiseptic. Used as a local **application** (5 to 15 grains in 1 fl. oz. of Water = 0·3 to 1 gramme in 28·4 c.c.) to syphilitic rashes and sores of the throat, tongue, etc.—*Ringer.*

Intravenous injection in syphilis.—*P.J.* '95, ii. 91. ½ p.c. solution as an antiseptic in ophthalmic practice.—*P.J.* '96, ii. 19.

Subconjunctival and intravenous injections, in the treatment of serous syphilitic disease of the eye.—*B.M.J.* '03, ii. 269.

A lotion containing 0·25 gramme per 1000 grammes of Water used in acute conjunctivitis (*M.P.* '05, ii. 303).

Solutions of the Cyanide or Oxycyanide are used for intravenous injection (*M.P.* '06, i. 149), as they do not coagulate the blood. One c.c. of a solution containing Mercury Cyanide, 1 gramme; Distilled Water, 100 grammes; is injected daily in syphilis. The intravenous injections appear to act very promptly, but the most absolute asepsis must be insisted on.

Dose.—Internally $\frac{1}{16}$ to ⅛ grain = 0·004 to 0·008 gramme.

Ph. Ger. maximum single dose, 0·02 gramme; maximum daily dose, 0·06 gramme.

Foreign Pharmacopœias.—Official in Belg. (Cyanuretum Hydrargyri); Fr. (Cyanure Mercurique); Ger., Hung. and Russ. (Hydrargyrum Cyanatum); Port. (Cyaneto Mercurico); Mex. (Cianuro de Mercurio).

Tests.—Mercuric Cyanide is decomposed on heating into metallic Mercury and Cyanogen gas, which burns with a purple flame. The aqueous solution is neutral in reaction towards Litmus paper; on the addition of Hydrochloric Acid it evolves the characteristic and highly poisonous odour of Hydrogen Cyanide; neither Potassium Hydroxide Solution nor Ammonia Solution yields a precipitate; Potassium Iodide Solution yields no precipitate until after the addition of Hydrochloric Acid, when the solution behaves in a similar manner to Mercuric Chloride Solution; Hydrogen Sulphide Solution yields a black precipitate, insoluble in Ammonium Hydrosulphide Solution and in diluted Nitric Acid; Stannous Chloride Solution yields at first a whitish precipitate of Mercurous salt and subsequently a grey deposit of metallic Mercury. When gently heated with an equal part of Iodine in a dry test-tube it yields in the lower portion of the tube a yellow sublimate subsequently becoming red, and in the upper portion a colourless needle-shaped crystalline deposit.

The more generally occurring impurities are Mercuric Chloride and mineral residue. A delicate test for the former is to add to the 5 p.c. aqueous solution faintly acidified with Nitric Acid, one or two drops of Silver Nitrate Solution, no precipitate or turbidity should result. A solution of similar strength to the above should yield no reddish precipitate soluble in an excess of the reagent on the gradual addition of Potassium Iodide Solution. Mineral residue is indicated by the ash left when the sample is ignited with free access of air.

Injectio Hydrargyri Cyanidi (Intravenous).—Mercuric Cyanide, 1 p.c.; inject 20 minims.—*Lock.*

Mercury Oxycyanide as an antiseptic, in aqueous solution, 1 in 200.—*B.M.J.E.* '95, ii. 104; *T.G.* '96, 405.

Mercury Oxycyanide is official in Mex.

MERCURY ZINCO-CYANIDE.—A product which has been found by Lord Lister to have valuable antiseptic properties.—*P.J.* (3) xx. 653; (3) xxii. 769.

There is also a **gauze** prepared with it.—*B.M.J.* '89, ii. 1025; *L.* '89, ii. 943.

Mercurialism resulting from use of the Cyanide gauze as a dressing.—*P.J.* '96, ii. 382.

Unguentum Hydrargyri et Zinci Cyanidi.—Mercury Zinc Cyanide, 2, 4 or 8 grains; Soft Paraffin, 1 oz.—*London Ophthalmic.*

HYDRARGYRI ETHYLENEDIAMINE CITRAS (Mercuramine).—A clear, colourless liquid, stated to be a 10 p.c. aqueous solution of Mercury Citrate containing 4 p.c. Ethylenediamine.

Introduced as an antiseptic.—*B.M.J.* '01, ii. 85; *P.J.* '01, ii. 142.

Under the title of **Sublamin** a combination of Mercury Sulphate and Ethylenediamine has been introduced. A 3 p.c. solution has been recommended as a disinfectant for the hands.—*B.M.J.E.* '02, i. 56.

This salt is stated (*B.M.J.* '05, i. 727) not to injure the skin or discolour steel instruments in alcoholic solution. As a 2 in 1000 alcoholic solution it gave results in sterilisation of the hands superior to any claimed for other methods, especially with regard to the power of penetration. May be conveniently kept as a 10 p.c. solution in Alcohol (50 p.c.).

HYDRARGYRI GALLAS (Mercury Gallate).—A dark grey or greyish-green amorphous powder, insoluble in Water. Is stated to be a more stable salt than the Tannate. Used in syphilis.

Dose.—¼ to 1 grain = 0·016 to 0·06 gramme, in a pill.

HYDRARGYRI NAPHTHOLACETAS.—Colourless, needle-shaped crystals, or as a white amorphous powder, insoluble in Water, has been used in syphilis.

Dose.—½ to 1 grain = 0·032 to 0·06 gramme.

HYDRARGYRI SALICYLAS ($HgC_7H_4O_3$, eq. 333·81).—A white or whitish amorphous odourless powder; practically insoluble in Water, and in Alcohol (90 p.c.). It contains theoretically 59·5 p.c. of metallic Mercury. It is soluble in Potassium or Sodium Hydroxide Solution with the production of double salts. It is not dissolved in the cold by halogen compounds of the alkali metals, but dissolves on warming, and when the solution cools double salts crystallise out.

Employed internally and by hypodermic injection, also as a dusting powder, in syphilis. Is stated to be as powerful an antiseptic as corrosive sublimate. An injection of 0·05 gramme recommended (*B.M.J.* '04, ii. 69) in tabes.

Intramuscular injection of Mercury Salicylate, 5; Liquid Paraffin, 50; one Pravaz syringeful, in syphilis.—*B.M.J.* '99, i. 122.

Maximum single dose, 0·02 gramme: maximum daily dose, 0·06 gramme.

In a large number of cases of syphilis intramuscular injections of 1 c.c. of the following emulsion. Mercury Salicylate, 1; Liquid Paraffin, 10. Injections once a week, and not more than six injections, followed by an interval of rest of about a couple of months.—*B.M.J.* '04, i. 609, 816.

Foreign Pharmacopœias.—Official in Ger., Jap., Mex., Russ., Swed. and Swiss.

Tests.—Mercuric Salicylate does not answer the tests distinctive of Mercuric salts. It yields no precipitate with Hydrogen Sulphide or Ammonium Hydrosulphide. It is decomposed by concentrated Hydrochloric, Nitric, and Sulphuric Acids, the solutions then yielding the distinctive tests given under Mercury. It yields a sublimate of metallic Mercury when heated in a dry test-tube. A saturated aqueous solution yields with Ferric Chloride T.S. a violet coloration. The method adopted by the *P.G.* for the determination of the Mercury is to mix a weighed quantity of 0·3 gramme with ten times its weight of Sodium Chloride and to dissolve the mixture in 100 c.c. of boiling Water, diluting the resulting solution to 400 c.c. The solution when slightly acidified with Hydrochloric Acid shall yield when completely precipitated with Hydrogen Sulphide 0·2 gramme of Mercuric Sulphide corresponding to 57·4 p.c. of metallic Mercury and 96·4 p.c. of pure Mercuric Salicylate. An alternative method is to dissolve the salt in 3·5 c.c. of Nitric Acid and 13 c.c. of Hydrochloric Acid, evaporate to dryness, the residue is rendered acid with Hydrochloric Acid dissolved in Water, filtered, and the filtrate precipitated with Hydrogen Sulphide.

The more generally occurring impurities are free Salicylic Acid and Sodium Salicylate. The former may be detected by the marked acid reaction of the salt towards a piece of moistened blue Litmus paper, the latter by any residue remaining when the specimen is ignited with free access of air.

HYDRARGYRI SUCCINIMIDUM ($Hg(C_4H_4O_2N)$, eq. 393·48).—White crystalline powder, soluble in Water. It should be kept in well-closed glass bottles of a dark amber tint and protected as far as possible from the light. It contains theoretically 50·5 p.c. w/w of metallic Mercury. Its solutions are stated not to precipitate albumen, and are therefore useful for hypodermic use. Used as a solution of Mercury Succinimide, 38¾ grains; Cocaine Hydrochloride, 15½ grains; Distilled Water, 775 grains.—*L.* '02, i. 1712.

The use of Cocaine Nitrate in place of the Hydrochloride would avoid the precipitation of Calomel.

Dose.—⅛ to ¼ grain = 0·008 to 0·016 gramme.

Foreign Pharmacopœias.—Official in Ital.

Tests.—Mercuric Succinimide yields a solution which gives with Potassium Iodide Solution a bright scarlet precipitate soluble in excess of the reagent; when acidified with diluted Hydrochloric Acid, Hydrogen Sulphide yields a black precipitate, insoluble in Ammonium Hydrosulphide Solution, and in hot diluted Nitric Acid Solution; a piece of bright Copper foil immersed in an acidified solution of the salt becomes coated with a bright metallic film; with Stannous Chloride Solution a grayish-white precipitate is produced changing to gray; with Albumen solution no precipitate is produced. When ignited with free access of air no weighable residue should remain.

HYDRARGYRI SULPHAS (Mercuric Sulphate). *Syn.* — HYDRARGYRI PERSULPHAS; SULPHATE OF MERCURY.

A white, heavy, crystalline powder, $HgSO_4$, eq. 294·14; prepared by dissolving Mercury in strong Sulphuric Acid and evaporating to complete dryness. It contains theoretically 67·6 p.c. w/w of metallic Mercury. It is decomposed by Water, forming a yellow oxysulphate called Turpeth Mineral (**$HgSO_4 . 2HgO$**), and free Sulphuric Acid.

Foreign Pharmacopœias.—Official in Fr. (Sulfate Mercurique Basique); Mex. Port. and Span. (Sulfato Mercurico). Not in the others.

Unguentum Hydrargyri Sulphatis Flavæ (Turpeth Mineral Ointment. Bazin's Ointment).—Yellow Mercury Sulphate, 15 grains; Benzoated Lard, 1 oz.

Useful in ringworm and seborrhœa capitis.

HYDRARGYRI TANNAS.—A greyish-green or blackish-grey powder, containing 40 to 50 p.c. of Mercury.

It should be preserved in well-closed bottles of a dark amber tint and protected as far as possible from the light.

It is decomposed by Water and the solutions of the alkalis. It is not materially affected by Diluted Hydrochloric Acid.

Medicinal Properties.—Very useful in syphilis.

It is decomposed by the alkali of the intestines, and the Mercury rapidly passes into the system.—*L.* '84, i. 723; *M.T.* '85, ii. 869.

Dose.—1 to 2 grains = 0·06 to 0·13 gramme, in a pill, three times a day, an hour before meals.

Foreign Pharmacopœias.—Official in Austr. (Hydrargyrum tannicum oxydulatum), contains about 55 to 57 p.c. of Mercury; Mex. (Tanato de Mercurio). Not in the others.

Tests.—Mercury Tannate is not materially affected by dilute Hydrochloric Acid, but the concentrated acid decomposes it with formation of Mercurous Chloride and Tannic Acid. It is decomposed by alkali Hydroxide solutions and solutions of alkali carbonates, the alkaline solution rapidly darkening on exposure to air. It should be free from Nitrates as ascertained by rubbing 0·3 gramme of the salt with 3 c.c. of Water, filtering and adding two drops of the filtrate to 5 c.c. of Diphenylamine Solution, when no blue colour should be produced. When ignited with free access of air it leaves no weighable residue.

HYDRARGYRI THYMOLACETAS.—A white micro-crystalline powder, almost insoluble in Water. Has been used in syphilis internally, or as an intramuscular injection (10 p.c. in liquid paraffin or vaseline oil).

Dose.—½ to 1 grain = 0·032 to 0·06 gramme.

HYDRARGYRI IODIDUM RUBRUM.

MERCURIC IODIDE.

B.P. Syn.—Biniodide of Mercury.

HgI_2, eq. 450·60.

Fr., Bi-iodure de Mercure; Ger., Quecksilberjodid; Ital., Bijoduro di Mercurio; Span., Yoduro Mercurio.

Scarlet-red crystals, or a scarlet-red crystalline powder.

It should be kept in well-closed glass bottles of a dark amber tint and protected as far as possible from the light.

It contains theoretically 44·1 p.c. of metallic Mercury.

Solubility.—Almost insoluble in Water; sparingly soluble in Glycerin; 1 in 300 of Alcohol (90 p.c.); 1 in 70 of Ether; 1 in 280 of Olive or Almond Oil or Lard; 1 in 50 of Castor Oil; insoluble in Paraffinum Molle; freely in an aqueous solution of Potassium Iodide or Mercuric Chloride.

Medicinal Properties.—Alterative. A powerful irritant poison in over-doses, similar to the Green Iodide, only much more active. It is used internally in the same cases as Corrosive Sublimate, more particularly in chronic glandular enlargements and rheumatism and cutaneous diseases when due to syphilis. As an antiseptic lotion (1 in 5000) in surgical and obstetric practice.

The Ointment is a most effective application for bronchocele, and a good application for warts and syphilitic nodes and for lupus. If applied to the eyelids, should be diluted to quarter the strength.

In infantile diarrhœa.—*Pr.* lv. 208; *P.J.* '95, ii. 215.

Has been used (*L.* '04, ii. 1396) in the form of a 1 in 1000 Chloroform solution for the sterilisation of cat-gut ligatures.

Recommended (*B.M.J.* '05, ii. 785) in the sterilisation of the hands before surgical operation; a 1 in 500 solution applied for two minutes by means of gauze, the hands being previously washed in a spirituous solution of green soft soap and very hot water, and dehydrated by means of gauze soaked in methylated spirit.

Dose.—$\frac{1}{32}$ to $\frac{1}{16}$ grain = 0·002 to 0·004 gramme.

Ph. Ger. maximum single dose, 0·02 gramme; maximum daily dose, 0·06 gramme.

Prescribing Notes.—*Usually given in the form of* **Pilules** *well triturated with Milk Sugar and 'Diluted Glucose.' When prescribed in* **Solution** *it is dissolved by the aid of Potassium Iodide. It can also be dissolved in Castor Oil and given in Capsules.*

Official Preparation.—Unguentum Hydrargyri Iodidi Rubri. Used in the preparation of Liquor Arsenii et Hydrargyri Iodidi.

Not Official.—Hydrargyri et Potassii Iodidum, Injectio Hydrargyri Iodidi Rubri and Unguentum Hydrargyri et Potassii Iodidi (Lutz's Ointment).

Foreign Pharmacopœias.—Official in Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap. (Hydrargyrum Biniodatum), Mex., Port., Russ., Span., Swiss and U.S.

Tests.—Mercuric Iodide becomes yellow when heated, but again assumes its scarlet colour on cooling; the *U.S.P.* specifies the temperature 150° C. (302° F.). When heated with Potassium Hydroxide Solution and a little Milk Sugar it yields a grayish precipitate of metallic Mercury. If this precipitate be well washed and dissolved in a mixture of Nitric and Hydrochloric Acid, it yields on neutralisation of the excess of acid the tests distinctive of Mercuric salts given under Hydrargyri Perchloridum. A portion of the filtrate, when slightly acidified with diluted Nitric Acid, yields with Silver Nitrate Solution a curdy yellow precipitate, insoluble in Nitric Acid, almost insoluble in Ammonia Solution, but soluble in Potassium Cyanide Solution. Another portion of the filtrate acidified with Hydrochloric Acid affords, on the addition of Chlorine Water, or Sodium Nitrite Solution, a reddish-yellow colour, soluble to a violet coloured solution in Carbon Bisulphide. The *B.P.* states that when heated with excess of Copper it should yield from 43·5 to 44 p.c. of metallic Mercury, but gives no indication as to whether the Mercury is to be gravimetrically or volumetrically determined. The *U.S.P.* states that it should contain not less than 98·5 p.c. of pure Mercuric Iodide, but gives no method of determination.

The more generally occurring impurities are Mercurous Iodide, Mercuric Chloride, soluble Chlorides or Iodides, and mineral matter. The absence of Mercurous Iodide may be ensured by the ready and complete solubility of the specimen in Ether, and in Potassium Iodide Solution; Mercuric Chloride, by Alcohol (94·9 p.c.) and Litmus Test described below; soluble Chlorides and Iodides, by the Hydrogen Sulphide and the Silver Nitrate Tests also given. When ignited with free access of air the salt leaves no weighable residue.

Alcohol and Litmus.—The cooled alcoholic solution of the salt should be colourless, and should not redden blue Litmus paper, *P.G.*; a saturated solution of the salt in hot Alcohol (94·9 p.c.), when cooled and diluted with an equal volume of Water should not redden blue Litmus paper, *U.S.P.*

Hydrogen Sulphide.—If the salt be thoroughly agitated with Water (0·5 gramme with 10 c.c., *U.S.P.*) and filtered, the filtrate should be only slightly coloured by T.S. of Hydrogen Sulphide, *P.G.* and *U.S.P.*

Silver Nitrate.—The filtrate obtained as above should only be rendered slightly opalescent with T.S. of Silver Nitrate, *P.G.* and *U.S.P.*

Preparations.

UNGUENTUM HYDRARGYRI IODIDI RUBRI. MERCURIC IODIDE OINTMENT. *B.P. Syn.*—OINTMENT OF RED IODIDE OF MERCURY.

Mix 1 of Mercuric Iodide, in fine powder, with 24 of Benzoated Lard. (1 in 25)

Foreign Pharmacopœias.—Official in Fr., Mercuric Iodide 1, Lard 8; Mex., Pomada, 1 in 50. Not in the others.

Not Official.

HYDRARGYRI ET POTASSII IODIDUM.—Yellow acicular crystals.

It is a powerful antiseptic.

INJECTIO HYDRARGYRI BINIODIDI (pro Vagina).—Mercuric Chloride 8 grains, Potassium Iodide 5 grains, Water to 1 fl. oz.; 1 fl. drm. to a pint of Water = 1 in 10,000.—*Lock.*

It requires 22 grains of the Potassium Iodide to form a solution.

INJECTIO HYDRARGYRI IODIDI RUBRI.—Red Iodide of Mercury, 5 grains; Iodide of Potassium, 20 grains; Water to 20 fl. oz..—*St. Bartholomew's.* (1 in 1750)

Mercuric Iodide, 1; Potassium Iodide, 4; Distilled Water, *q.s.* to produce 100. The dilution of this solution to 100 times its volume forms a 1 in 10,000 solution of Mercuric Iodide.—*B.P.C.*

UNGUENTUM HYDRARGYRI ET POTASSII IODIDI (Lutz's Ointment).—Red Mercuric Iodide, 5 grains; Potassium Iodide, 5 grains; Water, *q.s.*; Prepared Lard, 1 oz.

University has a similar preparation containing Wool Fat.

Not Official.

HYDRARGYRI IODIDUM VIRIDE.

GREEN IODIDE OF MERCURY. GREEN MERCUROUS IODIDE.

HgI, eq. 324·73.

A dull green powder containing excess of Mercury, which decomposes upon exposure to light.

It should be kept in well-closed glass bottles of a dark amber tint and protected as far as possible from the light.

It has been shown (*P.J.* '00, ii. 87) that the intensity of the green colour naturally depends upon the relative proportions or excess of Mercury employed. The yellow Mercurous Iodide of the *U.S.P.* is shown to be quite uniform in composition and also sufficiently stable when properly protected. It is naturally for the therapeutist to decide whether a Mercurous Iodide containing more or less free Mercury is preferable to the pure salt for medicinal use.—*C.D.* '00, ii. 164; *P.J.* '00, ii. 86.

Solubility.—Insoluble in Water, Alcohol, and Ether.

Medicinal Properties.—Given in syphilis and in tubercular and rheumatic affections. Employed as an **ointment** (1 part to 8 of Lard) for syphilitic eruptions, chronic skin diseases, enlarged glands, and bronchocele.

Dose.—It varies with different prescribers from $\frac{1}{6}$ grain to 2 grains = 0·01 to 0·13 gramme.

Ital. maximum single dose, 0·05 gramme; maximum daily dose, 0·20 gramme.

$\frac{1}{4}$ or $\frac{1}{5}$ grain three times daily, increasing the dose slowly until constitutional effects are produced.—*L.* '01, ii. 1038.

Prescribing Notes.—*It makes a good pill with Sugar of Milk and 'Diluted Glucose.'*

Incompatible with soluble Iodides.—*C.D.* '92, ii. 275.

Foreign Pharmacopœias.—Official in Austr., Hung., Swiss and U.S., (Hydrargyrum Iodatum flavum); Belg. (Proto Ioduretum Hydrargyri); Dutch and Swed. (Iodetum Hydrargyrosum); Fr. (Proto-Iodure de Mercure); Ital. (Joduro Mercuroso); Jap., (Hydrargyrum Iodatum); Mex. (Yoduro Mercurioso); Port. (Iodeto Mercuroso); Swiss (Hydrargyrum Iodatum); Span. (Ioduro Mercurioso).

Tests.—Mercurous Iodide melts when heated, and is entirely volatilised at a red heat. Dissolved in Nitric Acid it yields a solution answering the tests characteristic of Mercury given under Hydrargyrum. Under the influence of light it undergoes decomposition, with formation of Mercuric Iodide and metallic Mercury. Heated with Manganese Dioxide and Sulphuric Acid it evolves violet vapours of Iodine. When shaken in a dry test-tube with purified Ether, filtered, and the Ether evaporated, no residue should remain indicating the absence of Mercuric Iodide.

The yellow Mercurous Iodide is official in the *U.S.P.* and is required to contain not less than 99·5 p.c. of pure Mercurous Iodide. The absence of more than traces of Mercuric Iodide is ensured by shaking 0·5 gramme of the salt with 10 c.c. of Alcohol (94·9 p.c.) allowing to stand, and filtering; portions of the perfectly clear filtrate should be scarcely affected by Hydrogen Sulphide, should yield only a faint opalescence when dropped into Water, and only a faint red stain when evaporated in a white porcelain dish.

PILULA HYDRARGYRI IODIDI VIRIDIS.—Green Mercurous Iodide, ½ grain; Opium, ¼ grain; Extract of Gentian, 2 grains.

PILULES D'IODURE MERCUREUX OPIACÉES. Pilules de Ricord (*Fr.*).—Recently prepared Mercurous Iodide, 0·5 gramme; Powdered Opium, 0·2 gramme; Liquorice Powder, 0·3 gramme; Honey *q.s.*; divide into 10 pills.

UNGUENTUM HYDRARGYRI IODIDI VIRIDIS CUM ATROPINA.—Green Mercurous Iodide, 10 grains; Atropine, 1 grain; Lard, ½ oz.

HYDRARGYRI NITRATIS LIQUOR ACIDUS.

ACID SOLUTION OF MERCURIC NITRATE.

A heavy, colourless, strongly acid solution, containing about 33 p.c. of Mercury in the form of Mercuric Nitrate. It is obtained by dissolving, in the cold, 4 (by weight) of Mercury in 5 of Nitric Acid diluted with 1½ of Water. It should be preserved in well-stoppered amber-tinted glass bottles.

Medicinal Properties.—Caustic and antiseptic. Applied to syphilitic warts, ulcers, etc.; care should be taken that the surrounding healthy parts are not touched. Used in cancerous growths and in lupus. As a **gargle,** 1 or 2 minims to 1 fl. oz. Water. As an **injection** in gonorrhœa, 1 minim to 2 fl. oz. Water.

Official Preparations.—Unguentum Hydrargyri Nitratis and Unguentum Hydrargyri Nitratis Dilutum contain Mercuric Nitrate.

Foreign Pharmacopœias.—Official in U.S. (Liquor Hydrargyri Nitratis) prepared from Mercuric Oxide, sp. gr. about 2·086 at 25° C. (77° F.); Fr. (Azotate de Bioxyde de Mercure Dissous), sp. gr. 2·246; Ital. (Nitrato Mercurico liquido), sp. gr. 2·250; Port. (Soluto de Azotato Mercurico); Span. (Nitrato Mercurico Acido), sp. gr. 2·246; Mex, (Nitrato Mercurico). Not in the others.

Tests.—Acid Solution of Mercuric Nitrate has a sp. gr. of about 2·0. It yields when diluted the tests distinctive of Mercuric salts given under Hydrargyri Perchloridum. Ferrous Sulphate Solution carefully poured on to the surface of the solution yields a dark brown ring at the point of contact of the two fluids. It should be free from Mercurous salts as ascertained by the non-appearance of a precipitate or cloudiness, when the solution is diluted with Water, or on the addition of diluted Hydrochloric Acid. When evaporated to dryness and ignited with free access of air no weighable residue should remain.

UNGUENTUM HYDRARGYRI NITRATIS. MERCURIC NITRATE OINTMENT. *B.P.Syn.*—OINTMENT OF NITRATE OF MERCURY. *N.O.Syn.*—CITRINE OINTMENT.

Mercury (by weight), 1; Nitric Acid, 3; Lard, 4; Olive Oil (by weight), 7. Dissolve the Mercury in the Nitric Acid without the aid of heat, agitating gently from time to time. Heat the Lard and Olive Oil together on a sand-bath, so that the mixture when transferred to a heated earthenware jar, capable of holding 10 times the quantity, shall be at a temperature of about 290° F. (143·3° C.). Add the cold Mercurial Solution very gradually, stirring constantly to promote disengagement of the fumes. After frothing has ceased, the mixture, which should have a temperature of not less than 200° F. (93·3° C.), must be kept stirred until it is cold. The resulting Ointment should be firm in consistence and have a pale lemon colour.

(about 1 in 16¼)

The official directions given above do not work satisfactorily, the temperature is much too high and yields varying results with different operators, and even by the same operator at different times. The following method will yield a more uniform product.

Dissolve the Mercury in the Nitric Acid without the aid of heat. Heat the Lard and Oil on a water-bath, until the Lard is dissolved, and when at a temperature of 82·2° to 87·8° C. (180° to 190° F.) add the Mercuric Solution (cold) to the melted fats and stir continuously. When brisk effervescence has commenced continue the heat for 10 minutes, then remove from the water-bath and stir till cold.

The product should have a good consistence, and if kept in covered pots should retain its pale lemon colour for several months. In the hands of the author this method has never yielded a 'spongy' product. The heat should not be continued until all action has ceased, for the product will then be of a darker colour and blacken in the course of a week or two.—*P.J.* '97, i. 172; '98, ii. 165, 179, 232, 236; *C.D.* '98, i. 933; *A.J.P.* '97, 208, 232.

Two specimens made by the above process in 1898 were exhibited at an evening meeting in 1902 on account of their good condition of preservation. It is noted (*P.J.* '02, i. 314) that the two chief objections which have been raised to the Squire process are (*a*) that the Ointment must be, from the nature of the case, extremely acid, and (*b*) that however well stirred it is apt to be spongy. With regard to the former, it is shown that an Ointment prepared by the *B.P.* process contained the equivalent of 5·04 p.c. of Nitric Acid, whilst one prepared by 'Squire's process' indicated only 4·4 p.c.; with regard to the latter, the percentage of spongy batches was greater in the case of the Ointment made by the official than in that made by 'Squire's process.'

It is contended (*P.J.* '02, i. 350) the keeping properties of the above specimens were due to their initial excessive acidity, and that a specimen of Citrine Ointment should not necessarily be expected to retain its colour for a prolonged period. Attention is again drawn to the fact (*P.J.* '02, i. 368) that an Ointment prepared by the *B.P.* 1898 process was more acid than one prepared by the Squire process, and that, with one or two exceptions, it is generally admitted that the latter gives more uniform results than the former process. It is still regarded (*P.J.* '02, i. 394) as inconceivable that a carefully made *B.P.* Ointment could by any possibility contain more acid than one made by 'Squire's process'; and an explanation is asked for a specimen assaying 2·1 p.c. of acid. For a refutation of the opinion respecting the comparative acidities the reader is referred (*P.J.* '02, i. 436) to the experiments recorded *P.J.* '02, i. 314. The Mercury has generally been assumed to exist in the state of Mercuric Nitrate, and hence, presumably, the name given to it in the *B.P.* A percentage of 2·1 corresponds very closely with Mercurous Nitrate.

Ointments prepared by the official process and by that recommended by the author have been critically compared (*P.J.* '04, ii. 736). When freshly prepared there was little difference in them, the official being slightly darker. After six weeks the official Ointment had become slightly spongy. After a further six weeks the official was distinctly darker. After nearly five months that made by the author's process was still pale yellow in colour, whilst the official was distinctly darker. Although there is little to choose between the two methods, yet the evidence is somewhat in favour of Squire's method. The experiments repeated with ingredients obtained from different sources showed, in each case, a slight advantage in favour of Squire's method.

Medicinal Properties.—Applied in diseases of the skin as a parasiticide; in tinea tarsi it is diluted with 7 parts of Vaseline and applied by means of a camel's-hair pencil to the eyelids. Diluted with Glycerin and applied by a brush to the nostrils in ozœna.

This Ointment, when diluted with Lard, soon acquires a leaden colour; it changes less with Spermaceti Ointment, and least of all when diluted with Soft Paraffin.

Incompatibles.—All reducing agents, Camphor, Essential Oils, Lard, etc.

Official Preparation.—Unguentum Hydrargyri Nitratis Dilutum.

Not Official.—Unguentum Metallorum, Unguentum Hydrargyri Zinci et Plumbi.

Foreign Pharmacopœias.—Official in Belg., Mercury 5, Nitric Acid 7, Lard 45, Olive Oil 43; Fr., Mercury 1, Nitric Acid (sp. gr. 1·394) 2, Lard 10, Olive Oil 10; Mex., Mercury 4, Nitric Acid 6, Lard 64; Port., Sol. Mercuric Nitrate 2, Lard 9, Olive Oil 9; Swed., Mercury 1, Nitric Acid (sp. gr. 1·5) 2, Lard 12; U.S., Mercury 7, Nitric Acid (sp. gr. 1·414) 17·5, Lard 76.

UNGUENTUM HYDRARGYRI NITRATIS DILUTUM.

DILUTED MERCURIC NITRATE OINTMENT. *B.P.Syn.*—DILUTED OINTMENT OF NITRATE OF MERCURY.

Mix 1 of Mercuric Nitrate Ointment with 4 of yellow Soft Paraffin. (1 in 5)

It is more dilute than *B.P.* '85.

Not Official.

UNGUENTUM METALLORUM.—Mercuric Nitrate Ointment, Lead Acetate Ointment, Zinc Ointment, equal parts.—*King's and Great Northern.*

UNGUENTUM HYDRARGYRI ZINCI ET PLUMBI. *Syn.*—UNGUENTUM METALLORUM.—Mercurous Chloride, 10 grains; Mercuric Nitrate Ointment, 20 grains; Lead Acetate, 10 grains; Zinc Oxide, 20 grains; Soft Paraffin (yellow), to 1 oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.* as follows:—

Mercurous Chloride, 2; Mercuric Nitrate Ointment, 4; Lead Acetate, in powder, 2; Zinc Oxide, finely sifted, 4; Soft Paraffin (yellow), sufficient to produce 100.

HYDRARGYRI OLEAS.

MERCURIC OLEATE.

FR., OLÉATE DE MERCURE; GER., OELSAURES QUECKSILBER.

A brownish-yellow semi-solid oleaginous mass when fresh, but becoming of a stiffer consistence and darker colour on keeping, it should therefore be kept in well-stoppered glass bottles of a dark amber tint and exposed as little as possible. It is the precipitate obtained on mixing solution of Mercuric Chloride and Hard Soap.

An Oleate containing 20 p.c. is readily made as follows:—Mercuric Oxide (finely powdered), 4; Oleic Acid (by weight), 16; Ether (0·720), 1. Mix the Oxide of Mercury with the Ether and stir in rapidly the whole of the Oleic Acid, warm to 120° F., stirring frequently until the Oxide is dissolved. The operation should be complete in 1 to 2 hours.

This method has been incorporated in the *B.P.C.* under the title Oleinatum Hydrargyro.

A reversion to the method of direct combination of Mercuric Oxide and Oleic Acid has been recommended.

Mercuric Oleate was introduced by Prof. Marshall in 1872, and was made of three different strengths, containing respectively 5 p.c., 10 p.c., and 20 p.c. of Mercuric Oxide.

The 5 p.c. very quickly changed to a black colour, owing to reduction of the Mercuric Oxide; the 10 p.c. kept better, but not very long without change. It is better to keep the 20 p.c. and dilute it when required for use.

The Mercuric Oleate of the *U.S.P.* is prepared by the interaction of yellow Mercuric Oxide and Oleic Acid.

Medicinal Properties.—Similar to those of Mercury Ointment and Liniment, but more easily absorbed. Used with great success in tubercular peritonitis. Has been strongly recommended as an application for persistent inflammation in the joints or other parts near the surface, more particularly when combined with Morphine. It is useful, spread on lint and placed in the axilla, for syphilis; also as an application for non-ulcerated syphilitic indurations. A good application for pityriasis versicolor and for killing pediculi.

Official Preparation.—Unguentum Hydrargyri Oleatis.

Not Official.—Hydrargyri Oleas c. Morphina.

Foreign Pharmacopœias.—Official in Jap., Mex. and U.S. Not in the others.

Tests.—Mercuric Oleate heated with a piece of bright Copper foil and a little dilute Hydrochloric Acid deposits a film of metallic Mercury. When dissolved in Ether shaken with diluted Nitric Acid, and the aqueous acid portion separated, the latter yields the tests distinctive of Mercuric salts given under Hydrargyri Perchloridi. The washed ethereal liquid transferred to a flask, the Ether removed by distillation leaves a residue which consists mainly of Oleic Acid. A method for the determination of the Mercury is described *Y.B.P.* '01, 200. A weighed quantity of 2 grammes of the Oleate is weighed into a small tared beaker and stirred with 10 c.c. of Ether until completely disintegrated, 25 c.c. of Alcohol (90 p.c.) and 5 c.c. of Hypophosphorous Acid (30 p.c.) are then added and the whole retained on a water-bath until the reduced Mercury completely subsides leaving the fatty matter in solution. The liquid is poured off, the precipitate washed by decantation successively with Alcohol (90 p.c.) and Ether, the beaker and Mercury dried at 100° C. (212° F.), cooled and weighed. The weight multiplied by 50 yields the percentage w/w of metallic Mercury. The official Oleate was found to contain 23 p.c. The Oleate should leave no weighable residue upon ignition; when shaken with Water and filtered, the filtrate yields only a faint opalescence with Silver Nitrate Solution, and no marked darkening in colour with Hydrogen Sulphide.

Preparation.

UNGUENTUM HYDRARGYRI OLEATIS. MERCURIC OLEATE OINTMENT.

Mercuric Oleate, 1; Benzoated Lard, 3.

Not Official.

HYDRARGYRI OLEAS C. MORPHINA is made by dissolving 1 grain of Morphine alkaloid in each drm. of Mercuric Oleate (10 p.c.).

HYDRARGYRI OXIDUM FLAVUM.

YELLOW MERCURIC OXIDE.

HgO, eq. 214·68.

FR., OXYDE DE MERCURE JAUNE; GER., GELBES QUECKSILBEROXYD; ITAL., OSSIDO GIALLO DI MERCURIO; SPAN., OXIDO MERCURIO AMARILLO.

An orange-yellow heavy amorphous powder, being the precipitate obtained from solutions of Mercuric Chloride and Sodium Hydroxide. It is important that it should be protected from light.

Solubility.—Practically insoluble in Water or Alcohol (90 p.c.). Asparagin dissolves the freshly precipitated Oxide (*see* p. 125) to form **Mercury-Asparagin.**

Medicinal Properties.—Similar to Red Mercuric Oxide.

Ph. Ger. maximum single dose, 0·02 gramme; maximum daily dose, 0·06 gramme.

Official Preparation.—Unguentum Hydrargyri Oxidi Flavi.

Foreign Pharmacopœias.—Official in Austr., Hung., Jap. and Swiss, (Hydrargyrum Oxydatum Flavum); Belg. (Oxydum Hydrargyri Flavum); Dan. and Dutch (Oxydum Hydrargyricum Flavum); Fr. (Oxyde de Mercure Jaune); Ger. and Russ. (Hydrargyrum Oxydatum viâ Humidâ Paratum); Ital. (Ossido Mercurico Giallo; Norw. (Oxidum Hydrargyricum Flavum); Mex. and Span. (Oxido Mercurico Amarillo); Swed. (Oxydum Hydrargyricum Præcipitatum); U.S. (Hyd. Oxid. Flav.).

Tests.—Yellow Mercuric Oxide when gently heated assumes a red colour, and at a dull red heat it is completely decomposed into metallic Mercury and Oxygen, the presence of the latter can be demonstrated by placing the glowing end of a match into the vessel in which it is being heated; the match immediately igniting. The Oxide is readily and completely soluble in diluted Hydrochloric Acid, yielding a solution which answers the tests distinctive of Mercuric salts given under Hydrargyri Perchloridi. The *B.P.* requires that the proportion of metallic Mercury obtained, presumably when heated to incipient redness, should be 92 to 92·5 p.c., corresponding to 99·3 to 99·9 p.c. of pure Yellow Mercuric Oxide, but does not state how the Mercury is to be collected or determined. The *U.S.P.* states that it should contain not less than 99·5 p.c. of pure Yellow Mercuric Oxide, but does not give a method of determination. The *P.G.* gives neither a percentage nor method of determination.

It may be distinguished from the Red Oxide by digestion for 15 minutes on a water-bath with twice its weight of Oxalic Acid dissolved in a small quantity of Water, when it will be converted into white Mercuric Oxalate. The *P.G.* test directs agitation with a 1 in 10 Oxalic Acid Solution.

The more generally occurring impurities are fixed residue, Chlorides, foreign salts, Arsenic, and foreign metals. The *B.P.* examines only for fixed residue. It is required to yield only an insignificant amount when heated to incipient redness; the *U.S.P.* states that at a red heat it is finally volatilised, leaving not more than 0·1 p.c. of residue; the *P.G.* that 0·2 gramme shall leave at most a residue which cannot be weighed. The solution in diluted Nitric Acid should yield only the slightest opalescence with Silver Nitrate Solution, indicating the absence of Chlorides. Foreign salts, metals, and Arsenic may be detected by the tests given under Hydrargyri Subchloridum.

Oxalic Acid.—When it is agitated with Oxalic Acid Solution (1–10) it is gradually converted into a white crystalline powder, *P.G.*; when 0·5 gramme of Oxide and 1 gramme of Acid in 10 c.c. of Water is digested on a water-bath for 15 minutes the Oxide is converted into white Mercuric Oxalate (distinction from Red Mercuric Oxide), *U.S.P.*

Silver Nitrate.—A solution in dilute Nitric Acid (1–50) should be clear and should not afford more than slight opalescence with T.S. of Silver Nitrate, *P.G.*; 0·1 gramme of Oxide dissolved in 10 c.c. of diluted Nitric Acid should not afford more than a slight opalescence with Silver Nitrate Solution, *U.S.P.*

If 0·5 gramme of the Oxide be dissolved in a mixture of 2 c.c. of Hydrochloric Acid and 25 c.c. of Water, the solution should not respond to the *U.S.P.* tests for foreign salts, metals or Arsenic given under Hydrargyri Subchloridum, *U.S.P.*

Preparation.

UNGUENTUM HYDRARGYRI OXIDI FLAVI.—Yellow Mercuric Oxide Ointment.

Yellow Mercuric Oxide, in very fine powder, 10 grains; Yellow Soft Paraffin, 490 grains. (1 in 50)

Medicinal Properties.—Used in cases of chronic eczema, pityriasis, ringworm, chronic lichen, and syphilitic eruptions.

Diluted with an equal or twice the quantity of Vaseline, is a most valuable remedy for ophthalmia tarsi, corneal ulceration, and all forms of conjunctival inflammation.

A 4 p.c. Ointment of the Yellow Oxide in keratitis profunda.—*B.M.J.* '04, ii. 1303.

Several formulas are given in the Pharmacopœias of the London Hospitals containing from 2 to 60 grains to the oz.

Foreign Pharmacopœias.—Official in Belg., Yellow Oxide 1, Vaseline 49; Dutch, Yellow Oxide 1, White Vaseline 19; Fr. (Pommade d'Oxyde de Mercure Jaune), Yellow Oxide 1, Vaseline 19; Mex. (Pomada de Oxido Amarillo de Mercurio), Yellow Oxide 1, Vaseline 15; Ital. (Pomata di ossido giallo di mercurio), Yellow Oxide 1, Vaseline 15⅔; Jap., Yellow Oxide 1, Vaseline 9; Russ., Yellow Oxide 1, Lard 49; Span., Yellow Oxide 1, Vaseline 19; Swiss, Freshly precipitated Mercuric Oxide 5 in Water 15, Wool Fat 20, Vaseline 60; U.S., Yellow Mercuric Oxide 1, Water 1, Hydrous Wool Fat 4, Petrolatum, 4.

HYDRARGYRI OXIDUM RUBRUM.

RED MERCURIC OXIDE.

HgO, eq. 214·68.

FR., OXYDE DE MERCURE ROUGE; GER., QUECKSILBEROXYD; ITAL., OSSIDO MERCURICO ROSSO; SPAN., OXIDO MERCURICO ROJO.

Orange-red crystalline scales, or heavy crystalline orange-red powder, prepared from Mercurous Nitrate.

It should be kept in well-closed glass bottles of an amber tint and protected as far as possible from the light.

Solubility.—Insoluble in Water and Alcohol (90 p.c.); readily soluble in Hydrochloric Acid.

Medicinal Properties.—A powerful irritant, rarely used internally. Employed in form of ointment, *q.v.*

Ph. Ger. maximum single dose, 0·02 gramme; maximum daily dose, 0·06 gramme.

Official Preparation.—Unguentum Hydrargyri Oxidi Rubri.

Foreign Pharmacopœias.—Official in U.S.; Belg. (Oxydum Hydrargyri Rubrum); Dan., Dutch and Norw. (Oxydum Hydrargyricum); Fr. (Oxyde de Mercure Rouge); Ger. and Swiss (Hydrargyrum Oxydatum); Ital. (Ossido Mercurico Rosso); Jap. (Hydrargyrum Oxydatum Rubrum); Mex. (Oxido Mercurico); Port. (Oxydo Mercurico); Russ. (Hydrargyrum Oxydatum Levigatum); Span. (Oxido Mercurico Rojo). Not in Austr. or Hung.

Tests.—Red Mercuric Oxide undergoes change of colour when heated, turning a dark violet or almost black, but regains its original orange-red colour on cooling. The *U.S.P.* specifies a temperature 400° C. (752° F.). At a red heat it is decomposed into metallic Mercury and Oxygen, the presence of the latter can be ascertained in the same way as described under Hydrargyri Oxidum Flavum. It is readily and completely soluble in diluted Hydrochloric Acid, yielding a faintly opalescent solution which answers the tests distinctive of Mercuric salts given under Hydrargyri Perchloridum. It is officially required to answer the tests given in the *B.P.* under Hydrargyrum Oxidum Flavum, consequently the same remarks as are there made respecting the requisite official percentage of Mercury apply also here. The *U.S.P.* requires it to contain not less than 99·5 p.c. of pure Red Mercuric Oxide, but gives no method of determination. The *P.G.* gives neither a percentage nor a method of determination. It may be distinguished from the Yellow Oxide by remaining unaltered when treated with Oxalic Acid Solution. The *U.S.P.* digests the Oxide with Oxalic Acid and a small quantity of Water on a water-bath, requiring that it shall undergo no change in colour in 2 hours. The *P.G.* repeatedly agitates the Oxide with a 10 p.c. w/w Oxalic Acid Solution, when it should not undergo material change in 15 minutes. The *B.P.* does not include a similar test. The respective tests will be found in detail in small type below.

The more generally occurring impurities are fixed residue, Chlorides, Nitrates, metals, foreign salts, or Arsenic. The *B.P.* requires that it shall leave only an insignificant amount of fixed residue when heated to incipient redness; the *U.S.P.* that it leaves no appreciable residue at a red heat; the *P.G.* that 0·2 gramme shall at most leave a residue which cannot be weighed. Its solution in diluted Nitric Acid should yield only a slight opalescence at the most, with Silver Nitrate Solution. No test for Chlorides is included in the *B.P.* The *B.P.* test for Nitrates requires that it should not evolve orange fumes when heated in a dry test-tube; the *U.S.P.* and *P.G.* employ the Ferrous Sulphate and Sulphuric Acid Test. Metals, foreign salts, or Arsenic may be detected as described under Hydrargyri Subchloridum.

Oxalic Acid.—When Red Mercuric Oxide is repeatedly agitated with Oxalic Acid Solution (1–10) it should not undergo any material change in colour in 15 minutes, *P.G.*; 0·5 gramme of Oxide and 1 gramme of Oxalic Acid in 10 c.c. of Water, digested on a water-bath, the Mercuric Oxide should not change in colour in 2 hours, *U.S.P.*

Sulphuric Acid and Ferrous Sulphate.—If 1 gramme of Red Mercuric Oxide be mixed with 2 c.c. of Water and 2 c.c. of Sulphuric Acid added, on the further addition of 1 c.c. of Ferrous Sulphate T.S. poured carefully upon it, there should be no coloured zone at the junction of the liquids even after standing for some time, *P.G.*; 1 gramme mixed with 5 c.c. of Water and 2 c.c. of Sulphuric Acid, cooled, and 2 c.c. of Ferrous Sulphate T.S. carefully poured on it no brown-coloured zone should be developed at the line of contact on standing, *U.S.P.*

Silver Nitrate.—The solution of the Oxide (1–50) obtained by means of a dilute Nitric Acid should be clear and should only become slightly opalescent with T.S. of Silver Nitrate, *P.G.*; 0·1 gramme of the Oxide dissolved in 10 c.c. of diluted Nitric Acid should not produce more than a slight opalescence with T.S. of Silver Nitrate, *U.S.P.*

Preparations.

UNGUENTUM HYDRARGYRI OXIDI RUBRI. Red Mercuric Oxide Ointment. *B.P. Syn.*—Red Precipitate Ointment.

Red Mercuric Oxide, in very fine powder, ¼; Yellow Paraffin Ointment, 2¼. (1 in 10)

Medicinal Properties.— Stimulant for chronic ulcers and caustic for unhealthy granulations and soft warts; skin parasiticide. Much diluted, is used for ulcerations of the cornea and chronic ophthalmia, but the Ointment of the Yellow Oxide is preferred by many.

Foreign Pharmacopœias.—Official in Belg., 1 in 50; Dan., Dutch, Fr., Norw., Port. and Swiss, 1 in 20; Mex., Ger. and Ital., 1 in 16⅔; Jap., Span. and U.S., 1 in 10; Russ., with Yellow Oxide (p. 619). Not in Austr., Hung. or Swed.

HYDRARGYRI PERCHLORIDUM.

MERCURIC CHLORIDE.

$HgCl_2$, eq. 269·18.

FR., BICHLORURE DE MERCURE; GER., QUECKSILBERCHLORID; ITAL., BICHLORURO DI MERCURIO; SPAN., CLORURO MERCURIO.

B.P.Syn.—BICHLORIDE OF MERCURY; CORROSIVE SUBLIMATE; PERCHLORIDE OF MERCURY.

N.O.Syn.—Chloretum Hydrargyricum, Hydrargyrum Bichloratum, Sublimatus Corrosivus.

Heavy, colourless, rhombic crystals, or in crystalline masses, or a heavy white crystalline powder.

Odourless, and possessing a particularly acrid and persistent metallic taste but should only be tasted with extreme caution.

Solubility.—1 in 19 of Water; 1 in 5 of Alcohol (90 p.c.); 1 in 3 of Absolute Alcohol; 1 in 6 of Ether, *B.P.* (0·735); 1 in 11 of Purified Ether (0·720); 8 in 13 of Glycerin.

Medicinal Properties.—A powerful antiseptic and very poisonous; disinfectant, escharotic, alterative; given in very small doses in syphilitic affections, and in syphilitic and non-syphilitic skin diseases. Externally as a **lotion,** 1 grain to the fl. oz., or **ointment,** 2 to 8 grains in the oz., in chronic and parasitic skin diseases, and in acne and freckles; a solution of 1 in 1000 is used for syphilitic ulcers; as an ordinary surgical dressing and in obstetric practice 1 in 2000 to 5000 is sufficient; as an **injection,** 1 grain to 8 fl. oz., for chronic discharges, such as leucorrhœa and gonorrhœa; and as a **gargle,** 1 grain in 4 fl. oz., for ulcerated and syphilitic sore throat; as a **collyrium,** 1 grain in 8 fl. oz. For syphilis by **hypodermic injection,** $\frac{1}{30}$ to $\frac{1}{10}$ grain (with Sodium Chloride), in divided portions in the course of the day. As a local application in diphtheria.

An aqueous solution of 1 in 1000 is employed for disinfecting the hands, towels, sponges, etc., in operative surgery; it corrodes surgical instruments. A solution of the same strength is used for washing infected rooms, furniture and other articles, and for soaking infected linen. The solution is often coloured with aniline blue or methyl violet to guard against its being mistaken for water or other harmless fluid.

The disadvantages of Mercuric Chloride as a disinfectant and antiseptic are due (1) to its forming with albumen an inert and insoluble compound, (2) to its corrosive action on metals, and (3) to its being a powerful poison.

To prevent its antiseptic value being destroyed by the formation of an albuminate, five parts of Tartaric or Hydrochloric Acid should be added to each part of Mercuric Chloride.

In France it is legal to supply registered nurses (for obstetric purposes) with a lotion containing 0·025 gramme Mercuric Chloride and 1 gramme Tartaric Acid per litre, also an ointment containing 1 p.c. in Vaseline.—*A.J.P.* '90, 180.

As a disinfectant of enteric or other infectious stools and urine, an equal quantity of a 1 in 500 acidulated solution should be used. They should be thoroughly mixed and left in contact for at least 2 hours before they are finally disposed of.

Recommended for dysentery in India, $\frac{1}{15}$ grain every 4 hours.—*L.* '89, ii. 901.

Injection of Corrosive Sublimate solution in hydrocele.—*L.* '97, ii. 594; in tetanus.—*B.M.J.* '97, i. 138; in lupus.—*B.M.J.E.* '96, i. 52; and in other forms of tuberculosis.—*B.M.J.E.* '96, i. 71.

A handy and trustworthy preparation for use as hypodermic injection in syphilis is:—Mercury Perchloride, 1 grain; Glycerin, 1 fl. drm.; Distilled Water, 1 fl. drm. A stable preparation which can be kept for several days or weeks. 10 minims of the solution = $\frac{1}{12}$ grain Mercuric Chloride.—*L.* '01, ii. 1038.

Mercuric Chloride and Sodium Chloride of each, 1·2 grammes; in 189 c.c. Water. 2 c.c. injected daily for 2 weeks, a day's interval after six injections (*Hillier*).—*M.A.* '02, 42. Great objection to the intramuscular injection of Perchloride is the pain caused by it, which is often considerable.—*L.* '01, ii. 522.

$\frac{1}{12}$ grain three times a day in the treatment of lichen planus.—*B.M.J.E.* '01, ii. 64.

Mercurial salts are the most efficient antiseptic agents we possess in surgical practice, and it may be argued that the therapeutic action of Mercury when administered internally is to be accounted for to a great extent by its antiseptic property. Mercuric Chloride is most valuable as a bactericide in the treatment of scarlet fever.—*B.M.J.* '03, ii. 231.

With regard to fluid disinfectants, a 1 in 1000 solution of corrosive sublimate with 24 hours' exposure, destroyed all microbes, including the spores of anthrax, and the tubercle bacilli. Anthrax spores were only destroyed with certainty by Mercuric Chloride. Report on the practical experiments on disinfection undertaken for the London County Council.—*L.* '02, i. 758; *B.M.J.* '02, i. 792.

$\frac{1}{4}$ grain dissolved in $2\frac{1}{2}$ oz. of Water, injected into the pleural cavity, after tapping, in a case of empyema.—*B.M.J.* '03, i. 78.

Experiments in intravascular antisepsis. That Mercury Perchloride, Mercury Oxycyanide and Protargol cannot be injected intravenously into rabbits in sufficient strength to produce an antiseptic effect lasting several days.—*L.* '03, i. 99.

Three to five injections of a 5 p.c. solution have been successfully given intramuscularly in infantile syphilis in 40 cases (*B.M.J.E.* '04, ii. 60). 3-minim doses of the Liquor can be given in syphilis to an infant one month old, 5 to 10 minims three times daily for an infant six months old (*L.* '04, ii. 1405).

In the sterilisation of the hands for surgical operations. A preliminary wash with soap and hot water, followed by rubbing the hands with Sublimate Alcohol 1 in 1000, and then polishing with a dry sterile cloth shown (*B.M.J.* '05, ii. 781) to be the most efficient.

One c.c. of a solution containing Mercury Perchloride, 1 gramme; Sodium Chloride pure, 10 grammes; Distilled Water, 100 grammes, representing a dose of 1 centigramme injected intramuscularly in syphilis (*M.P.* '06, i. 148); the dose may be increased to 2 centigrammes daily for 20 days.

Dose.—$\frac{1}{32}$ to $\frac{1}{16}$ grain = 0·002 to 0·004 gramme.

Ph. Ger. maximum single dose, 0·02 gramme; maximum daily dose, 0·06 gramme.

Prescribing Notes.—*Generally prescribed in the form of the* **Liquor** *or given in* **pills** *well triturated with Milk Sugar and massed with 'Diluted Glucose.'*

Compressed Discs are prepared for making an antiseptic solution 1 in 1000, *see* Not Official.

Incompatibles.—Alkalis and their Carbonates, Lime Water, Tartar Emetic, Silver Nitrate, Lead Acetate, Albumen, Soaps, Decoction of Cinchona, Tannin, Alkaline Sulphides. Potassium Iodide converts it into Mercuric Iodide, soluble in excess.

Official Preparations.—Liquor Hydrargyri Perchloridi, and Lotio Hydrargyri Flava. Used in the preparation of Hydrargyri Oleas, Hydrargyri Oxidum Flavum, and Hydrargyrum Ammoniatum.

Not Official.—Corrosive Sublimate Discs, Sublimate Wood Wool, Sublimate Gauze, Sublimate Wool, Injectio Hydrargyri Hypodermica, Injectio Sal Alembroth Hypodermica, Liquor Hydrargyri et Ammonii Chloridi, Lotio Hydrargyri Acetica, Lotio Hydrargyri Perchloridi, Lotio Hydrargyri Perchloridi Acida, Preservative Solution, Poudre de Sublimé Corrosif et d'Acide Tartrique, Sal Alembroth.

Antidotes.—In poisoning by Corrosive Sublimate, raw eggs should be administered in large quantity; flour with milk may also be given; the stomach should then be washed out or an emetic employed.

Foreign Pharmacopœias.—Official in Austr. and Hung. (Hydrargyrum Bichloratum Corrosivum); Belg. (Sublimatus Corrosivus); Dan., Norw. and Swed. (Chloretum Hydrargyricum Corrosivum); Dutch (Chloretum Hydrargyricum); Fr. (Bichlorure de Mercure); Ger., Jap., Russ. and Swiss (Hydrargyrum Bichloratum); Ital. (Bichloruro di Mercurio); Port. (Chloreto Mercurico); Mex. and Span. (Cloruro Mercurico); U.S. (Hydrargyri Chloridum Corrosivum).

Tests.—Mercuric Chloride dissolves in Water, forming a solution which yields with Ammonia Solution a white precipitate; with excess of Hydrogen Sulphide Solution a black precipitate insoluble in Ammonium Hydrosulphide Solution, and in hot diluted Nitric Acid; with Potassium or Sodium Hydroxide Solution a yellow precipitate; with Potassium Iodide Solution a brilliant scarlet precipitate, soluble in an excess of the reagent or in a considerable excess of the Mercuric Chloride Solution. An aqueous solution, when boiled with Copper foil, gives a grey deposit, which assumes a silvery lustre on being rubbed. Potassium or Sodium Hydroxide Solution does not produce a precipitate in a Glycerin Solution; in solutions containing both Glycerin and Potassium or Sodium Hydroxide, Ammonium Hydrosulphide Solution produces no precipitate. With Silver Nitrate it affords a white precipitate, which when filtered and washed is insoluble in Nitric Acid but dissolves readily in Ammonia Solution.

It is officially required to yield 72·8 to 73·8 p.c. of metallic Mercury, corresponding to 98·57 to 99·92 p.c. of pure Mercuric Chloride, when heated with excess of Lime. The *U.S.P.* requires that it shall contain not less than 99·5 p.c. of pure Mercuric Chloride, but gives no method for its quantitative determination. The *P.G.* gives neither a requisite percentage nor a method of determination. Mercuric Chloride contains theoretically 73·8 p.c. of metallic Mercury.

The more generally occurring impurities are fixed residue, foreign salts, Arsenic, and metals other than Mercury. The specimen should leave, after sublimation, according to the *B.P.* only a trace of fixed residue, according to the *U.S.P.* no appreciable residue, and according to the *P.G.* it first fuses and is then completely volatilised. Foreign salts may be detected in the filtrate after precipitation of the Mercury with Hydrogen Sulphide as described below under the Hydrogen Sulphide Test. Arsenic, if present, is also precipitated as Sulphide and may be extracted by digestion with Ammonia Solution, the filtered liquid being evaporated to dryness, moistened with 6 drops of Nitric Acid, dried and examined by the Modified Gutzeit's Test. Heavy metals other than Mercury may be detected by treating the Sulphide insoluble in Ammonia Solution with diluted Nitric Acid, filtering, evaporating the filtrate to dryness, and igniting, when no weighable residue should remain. It should be readily and completely soluble in Ether.

Alcohol or Water.—If 1 gramme of the finely powdered salt be dissolved in 10 c.c. of Alcohol (94·9 p.c. by volume) or 20 c.c. of Water, it should leave not more than 0·005 gramme of residue, *U.S.P.*

Hydrogen Sulphide.—If to 0·5 gramme of the salt dissolved in 20 c.c. of Water, 5 c.c. of Hydrochloric Acid be added, and the solution be completely saturated with Hydrogen Sulphide, allowed to stand for several hours in a well-corked flask until the precipitate has subsided, and then filtered, the filtrate should be colourless, and leave no weighable residue upon evaporation, *U.S.P.*

Modified Gutzeit's Test.—The precipitate obtained in the preceding paragraph, after washing with about 100 c.c. of Water, and draining, is rinsed into a beaker with 20 c.c. of Water, and then 5 c.c. of stronger Ammonia Water (sp. gr. 0·897 at 25° C. (77° F.)) added. If, after covering and digesting this mixture for about 15 minutes on a bath of boiling Water, it be rinsed upon a filter, and washed with a little Water, the filtrate and washings, after evaporating to dryness, moistening with 6 drops of Nitric Acid, and again drying, should not respond to the Modified Gutzeit's Test for Arsenic, *U.S.P.*

Preparations.

LIQUOR HYDRARGYRI PERCHLORIDI. SOLUTION OF MERCURIC CHLORIDE.

1 grain of Mercuric Chloride, dissolved in 2 fl. oz. of Distilled Water. (1 in 875)

Contains $\frac{1}{16}$ grain in 1 fl. drm. Ammonium Chloride now omitted.

Dose.—$\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c.

Ital. maximum single dose, 20 grammes; maximum daily dose, 100 grammes.

Foreign Pharmacopœias.—Official in Belg. (Liquor Sublimati Corrosivi (Van Swieten); Fr. (Soluté de Chlorure Mercurique); Ital. (Soluzione Idroalcoolica di Bicloruro di Mercurio); Port. (Soluto de Chloreto Mercurico); all 1 in 1000; Mex. (Solucion de Van-Swieten), 1 in 1000, containing 10 p.c. of Alcohol (80°); Span. (Solucion Hidro-Alcoholica de Cloruro Mercurico), 1 in 1000. Not in the others.

LOTIO HYDRARGYRI FLAVA. YELLOW MERCURIAL LOTION. *B.P.Syn.*—YELLOW WASH.

Mercuric Chloride, 20 grains; Solution of Lime, 10 fl. oz. (1 in 219)

Now 2 grains to the fl. oz.

This lotion owes its efficacy to the precipitated Mercuric Oxide, and is used for the same purposes as Mercuric Oxide Ointment.

Foreign Pharmacopœias.—Official in Mex. (Agua Fagédenica Roja), 1 in 600. Not in the others.

Not Official.

CORROSIVE SUBLIMATE DISCS.—Compressed discs containing $8\frac{3}{4}$ grains of Mercuric Chloride, with an equal weight of Sodium Chloride, and coloured with Methyl Violet.

One disc dissolved in a pint of Water forms a solution containing 1 of Mercuric Chloride in 1000.

One pint of London Water with 10 grains of Mercuric Chloride makes a clear solution, also with the addition of 10 grains of Sodium Chloride; but with 10 grains of Ammonium Chloride it is very turbid. The latter, therefore, should not be used in making the discs.

Foreign Pharmacopœias.—Official in Austr., Ger., Ital., Jap. and Sweden, 1 and 2 grammes, red. All made with a mixture of equal parts of Mercuric and Sodium Chlorides. Dutch, 1 gramme, blue.

POUDRE DE SUBLIMÉ CORROSIF ET D'ACIDE TARTRIQUE (*Fr.*).—Powdered Mercuric Chloride, 2·5 grammes; Powdered Tartaric Acid, 10 grammes; Solution of Soluble Indigo (5 p.c.), 10 drops. Mix to a uniform tint, dry, and divide into ten packets. The contents of each packet, when dissolved in a litre of Water, gives a solution 1 in 4000.

LIQUOR HYDRARGYRI ET AMMONII CHLORIDI.—Mercuric Chloride, 10; Ammonium Chloride, 10; Tartaric Acid, 10; Distilled Water, *q.s.* to make 100.—*B.P.C.*

The addition of Tartaric Acid is necessary to prevent precipitation on diluting the solution with ordinary Water.—*B.P.C.*

The two Chlorides dissolve in the Water, but immediately after the addition of the Tartaric Acid a precipitate is formed.

The addition of Tartaric Acid to solution of Mercuric Chloride to prevent the formation of insoluble albuminous compounds when applied to animal tissues.—*B.M.J.* '88, i. 148.

Dott called attention to the reduction of the Mercuric Chloride by Tartaric Acid in dilute solution.—*P.J.* '89, i. 841.

LOTIO HYDRARGYRI ACETICA.—Mercuric Chloride, 1; Acetic Acid, 75; Glycerin, 75; Alcohol (90 p.c.), 250; Rose Water, 500.—*Martindale.*

To destroy pediculi and detach their ova.

Mercuric Chloride, 0·20; Acetic Acid, 8; Glycerin, 8; Alcohol, 27·50; Rose Water, *q.s.* to produce 100.—*B.P.C.*

LOTIO HYDRARGYRI PERCHLORIDI (1 in 500).—Mercuric Chloride, 1 oz.; Water to 500 fl. oz. To be diluted with one to ten parts of Water as directed. Usually tinted with fuchsin or methylene blue.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

LOTIO HYDRARGYRI PERCHLORIDI ACIDA.—Mercuric Chloride, 1 oz.; Hydrochloric Acid (strong), 25 fl. oz.; Water to 500 fl. oz. This is used only as a disinfectant for excreta.—*St. Thomas's.*

This has been incorporated in the *B.P.C.* under the title **Solutio Hydrargyri Perchloridi Acida.**

SUBLIMATE WOOD WOOL.—Pinewood almost in a state of powder, containing ½ p.c. of Corrosive Sublimate. It is highly absorbent.

SUBLIMATE WOOL (*Ital.*).—Absorbent Wool containing 1 of Mercuric Chloride in 400.

SUBLIMATE GAUZE (*Fr.*).—Prepared Gauze containing 0·1 to 0·5 p.c. of Corrosive Sublimate.

INJECTIO HYDRARGYRI HYPODERMICA.—Mercuric Chloride, ½ grain; Sodium Chloride, pure, 5 grains; Water to 1 drm.

Dose.—4 to 12 minims = $\frac{1}{30}$ to $\frac{1}{10}$ grain in divided portions in the course of one day.

PRESERVATIVE SOLUTION (for Anatomical subjects).—Corrosive Sublimate, 10 grains; Glycerin, 21 fl. oz.; Methylated Spirit, *q.s.* to make 80 fl. oz. For injection into the femoral artery.

SAL ALEMBROTH. — Mercuric Ammonium Chloride, $2NH_4Cl.HgCl_2,H_2O$, eq. 393·32. *Syn.* Ammonio-Mercuric Chloride, Salt of Wisdom, Sel de la Sagesse ou de la science.

White rhombic prisms or tabular crystals, which readily part with their Water of crystallisation when exposed to dry air.

It contains theoretically 50·5 p.c. of metallic Mercury.

Solubility.—2 in 1 of Water, 1 in 3½ of Alcohol (90 p.c.), 1 in 1 of Glycerin.

Medicinal Properties.—A powerful antiseptic, but it is not so irritating as Corrosive Sublimate. Used in the antiseptic treatment of wounds

For **Hypodermic** injection in syphilis, ½ grain dissolved in 10 minims of Water.—*B.M.J.* '88, i. 905.

Alembroth **Gauze**, 1 p.c.; **Wool**, 2 p.c.; they are tinted with aniline blue, and as the colour is bleached by purulent discharge, soakage of the dressing is readily noted.

Injectio Sal Alembroth Hypodermica.—Mercuric Chloride 32 grains Ammonium Chloride 16 grains, Distilled Water 2 fl. oz.—*Lock.*

Dose.—10 minims = ½ grain of Sal Alembroth to be used for an **injection.**

Tests.—Mercuric Ammonium Chloride volatilises when strongly heated. Its aqueous solution is neutral in reaction towards Litmus paper, whilst an aqueous solution of Mercuric Chloride possesses a faintly acid reaction towards that indicator of neutrality. Potassium or Sodium Hydroxide Solution produces a white precipitate in the aqueous solution. It should leave no weighable residue when ignited with free access of air.

HYDRARGYRI SUBCHLORIDUM.

MERCUROUS CHLORIDE.

B.P. Syn.—CALOMEL; HYDRARGYRI CHLORIDUM. SUBCHLORIDE OF MERCURY.

Hg_2Cl_2, eq. 467·98.

FR., PROTOCHLORURE DE MERCURE; GER., QUECKSILBERCHLORÜR; ITAL., CHLORURO MERCUROSO; SPAN., CLORURO MERCURIOSO.

A heavy, white or whitish, odourless, tasteless, impalpable powder which should be protected from the light.

Solubility.—Insoluble in Water, Alcohol (90 p.c.), or Ether.

Medicinal Properties.—Alterative, indirect cholagogue, purgative, antiseptic, and diuretic.

As an alterative it is used in syphilitic affections, chronic skin diseases, and glandular enlargements.

Useful in chronic hepatitis, catarrhal jaundice, and in chronic pharyngitis; repeated small doses of great benefit in obstinate vomiting; also, in the gastro-intestinal catarrh and diarrhœa of children, for whom the absence of taste renders it convenient.

As a purgative in biliousness, hepatic and cardiac dropsy, apoplexy, gout, cirrhosis, and in congested and torpid liver due to free living.

In enteric fever, the stupor, tremor, headache and coma, all of which may be due to intestinal sepsis and ptomaines, are removed, and the entire aspect of the case changed, by 1 to 3 grains of Calomel.—The late *Sir W. Broadbent.*

In hiccough, one grain every hour is often successful. Its *local uses* are numerous: as an **insufflation**, or as a **gargle** in syphilitic sore throat; as an **injection** with or without Lime Water in blenorrhagia. In a wide range of skin affections, but especially syphilitic, it is invaluable as an **ointment.**

For **fumigation**:—A spirit lamp underneath a metal cup containing 20 grains of Calomel is placed under a cane-seated chair, on which the patient remains seated for 20 minutes, his body being covered with a blanket; an apparatus contrived by Mr. Lee is still better.

It is probable that the cholagogue action of Calomel is due to its having a peculiar stimulant action on the duodenum and ileum, so as to hurry the bile along the intestine and prevent its re-absorption.—*Brunton.*

Should not be applied to the eye when a patient is taking Potassium Iodide, for it will cause severe inflammation.

On the treatment of acute diseases, particularly enteric fever and appendicitis, by a judicious use of Calomel, Water, Heat and Quinine.—*B.M.J.* '01, ii. 1054.

Although not a specific, is a most useful remedy in typhoid fever.—*B.M.J.E.* '99, i. 4.

Weekly injections of 0·05 gramme have proved successful (*B.M.J.E.* '04, ii. 72) in optic neuritis, after injections of the Cyanide and Biniodide have been tried without avail.

In enteric fever (*B.M.J.* '04, ii. 1450) it has been shown that, of the various drugs which are known to possess antiseptic properties, Calomel is undoubtedly one which has received earliest and widest recognition; 3 to 5 grains are given during the first week of the attack, before there is much diarrhœa.

Has been used in large doses in the treatment of dysentery (*I.M.G.* '05, ii. 280); 5 to 7 grains every five or six hours, or in smaller doses of 1 grain more frequently. Very frequently prescribed with drugs such as Ipecacuanha and Opium, or in ½ grain doses with 5 grains of Naphthalin 10 or 12 times in the 24 hours. Fractional doses have been given to children.

A valuable anthelmintic in ankylostomiasis (*L.* '05, i. 865).

As an intramuscular injection in syphilis, an emulsion made by the following formula is useful (*M.P.* '06, i. 149): sublimed Calomel, 1 gramme; pure liquid Vaseline, 10 c.c. The average weekly dose is 10 c.c.

A proteid or colloidal form of Calomel is known under the name of **Calomelol.** It forms a greyish-white odourless and tasteless powder, soluble in Water, but insoluble in Alcohol (90 p.c.).

Injections of Calomel the best method of treating syphilis.—*L.* '07, ii. 13.

Dose.—½ to 5 grains = 0·032 to 0·32 gramme.

Swiss, maximum single dose, 0·5 gramme; maximum daily dose, 2·0 grammes.

Prescribing Notes.—*Calomel can be made into* **pills** *with Glucose, and if the pills be too small, they can be made larger by the addition of Milk Sugar. It is frequently prescribed with Compound Rhubarb Pill or Compound Pill of Colocynth and Henbane.*

Incompatibles.—Bromides and Iodides, Nitro-Hydrochloric Acid, Hydrocyanic Acid, Chlorides of the Alkalis. Soap, even when neutral. Solutions of Lime, Potassium Hydroxide, or Sodium Hydroxide.

Official Preparations.—Lotio Hydrargyri Nigra, Pilula Hydrargyri Subchloridi Composita, and Unguentum Hydrargyri Subchloridi.

Not Official.—Calomel Cream (*Squire*), Emplastrum Calomelanos, Pastillus Hydrargyri Chlorati cum Talco, Pilula Calomelanos cum Coloc., Pilula Hydrargyri Subchloridi et Jalapæ, Pilula Hydrargyri Subchloridi et Scammonii, Pilula Zittmann, Pulvis Basilicus, Pulvis Rhei cum Hydrargyro, Pulvis Calomelanos et Acidi Borici, Pulvis Calomelanos et Amyli, and Pulvis Calomelanos et Zinci Oxidi.

Foreign Pharmacopœias.—Official in Belg. (Calomelas); Dan. and Norw. (Calomel); Fr. (Protochlorure de Mercure par volatilisation), also (Protochlorure de Mercure par Précipitation); Dutch (Chloretum Hydrargyrosum), also (Chloretum Hydrargyrosum ope Vaporis Aquæ paratum); Swed. (Chloretum Hydrargyrosum Precipitatum); Austr. and Hung. (Hydrargyrum Chloratum Mite), both the levigated and that sublimed in steam; Ger., Jap., and Swiss (Hydrargyrum Chloratum), also (Hydrargyrum Chloratum Vapore Paratum); Ital. (Chloruro Mercuroso); Mex. (Cloruro Mercurioso al Vapor), also (Precipitado); Port. (Chloreto Mercuroso), also (Mercurio Doce); Russ. (Hydrargyrum Chloratum Levigatum), also (Hydrargyrum Chloratum Vapore Præparatum); Span. (Cloruro Mercurioso) (Sublimado, por el Vapor, and Precipitado); U.S. (Hydrargyri Chloridum Mite).

The following synonyms are applied to Calomel obtained by precipitation :—Fr., Précipité Blanc; Port. and Span., Precipitatum Album. These terms do not mean, as in England, Ammoniated Mercury.

Tests.—Mercurous Chloride volatilises when strongly heated. With Calcium, Potassium or Sodium Hydroxide Solution or with Ammonia Solution it yields a black precipitate, in the case of the three former solutions the precipitate consists of Mercurous Oxide, in the latter case it consists of a Mercurousamido salt. It is converted by Hydrocyanic Acid into a Mercuric salt and a black powder readily yielding metallic Mercury. When heated with alkali Carbonate in a dry test-tube it yields a sublimate of metallic Mercury. If the alkaline residue be dissolved in diluted Nitric Acid it affords with Silver Nitrate Solution a white curdy precipitate insoluble in Nitric Acid. It is officially required to yield when heated with an excess of Lime, from 84·4 to 84·9 p.c. of metallic Mercury, corresponding to from 99·34 to 99·92 p.c. of pure Mercurous Chloride. The *U.S.P.* states that it should contain not less than 99·5 p.c. of pure Mercurous Chloride but gives no method of determination by which this percentage may be ensured. The *P.G.* gives neither the requisite percentage nor a method of determination. It contains theoretically 84·96 p.c. by weight of metallic Mercury.

The more generally occurring impurities are fixed residue, Mercuric Ammonium Chloride, Mercuric Chloride, foreign salts, *e.g.*, metals of the alkali earths, Arsenic, foreign metals. The *B.P.* requires that when volatilised it shall leave only a trace of fixed residue, the *U.S.P.* no appreciable residue, the *P.G.* that it completely volatilises.

The *B.P.* test for the absence of Mercuric Ammonium Chloride is that the specimen shall not evolve Ammonia when heated with Potassium Hydroxide Solution, the test is supplemented in the *U.S.P.* by the requirement that the filtered Acetic Acid extract shall not be affected by Hydrogen Sulphide or Silver Nitrate Solution. The official method of detecting Mercuric Chloride is by shaking the sample with warm Ether, which on filtration and evaporation should leave no residue. This evaporation must be performed at a low temperature, otherwise the Perchloride (if present) will volatilise in the Ether vapour. The *U.S.P.* requires that the residue remaining after the evaporation of the Ether when dissolved in water shall not yield more than a slight opalescence with Silver Nitrate T.S. and no change in colour with Ammonium Hydrosulphide Solution. The *P.G.* dispenses with an evaporation in testing for the presence of Mercuric Chloride, extracting the sample with Alcohol (60 p.c.), filtering, and requiring that the filtrate shall be unaffected by either Hydrogen Sulphide, or Silver Nitrate Solution. Foreign salts may be detected after the complete removal of the Mercury by Hydrogen Sulphide as described below, the filtrate should leave no weighable residue upon evaporation to dryness and gentle ignition. Arsenic, if present, would be precipitated along with the Mercury as Sulphide and may be extracted by digestion with stronger Ammonia Water and after treating as described below, examined by the modified Gutzeit's test. The precipitated Mercuric Sulphide remaining after the Ammonia treatment may be warmed with diluted Nitric Acid and filtered, the filtrate when evaporated to dryness and ignited should leave no weighable residue.

Silver Nitrate.—If 1 gramme be shaken with 10 c.c. of dilute Alcohol and filtered, the filtrate should not be affected by T.S. of Silver Nitrate, *P.G.*; 2 grammes of the salt shaken with 20 c.c. of Ether, filtered, the filtrate evaporated and 10 c.c. of distilled Water added, 5 c.c. of the filtrate from this should yield not more than a slight opalescence with Silver Nitrate T.S. A portion of the salt shaken with Acetic Acid and filtered, the filtrated liquid should not be affected by T.S. of Silver Nitrate (distinction from and absence of Ammoniated Mercury), *U.S.P.*

Hydrogen Sulphide.—If 1 gramme of Mercurous Chloride be shaken with 10 c.c. of Alcohol, as above, the filtrate should not be affected by T.S. of Hydrogen Sulphide, *P.G.*; 1 gramme of the salt shaken with 10 c.c. of Water or Alcohol, and the mixture filtered, the filtrate should not respond to the time-limit test for heavy metals, *U.S.P.* The filtrate obtained after shaking a portion of the salt with Acetic Acid and filtering should not be effected by T.S. of Hydrogen Sulphide, *U.S.P.* If to 0·5 gramme of Mercurous Chloride contained in a small beaker, 5 c.c. of Nitric Acid be added, and the mixture evaporated to dryness on a water-bath, and if, after dissolving the residue in about 25 c.c. of Distilled Water and 5 c.c. of Hydrochloric Acid, the solution be completely saturated with Hydrogen Sulphide and allowed to stand for several hours in a well-corked flask, until the precipitate has subsided, and then filtered, the filtrate should be colourless and leave no weighable residue upon evaporation and gentle ignition, *U.S.P.*

Gutzeit's Test.—The precipitate obtained in the preceding test should be washed with about 100 c.c. of Water, then drained and rinsed into a beaker with about 20 c.c. of Water, and then 5 c.c. of Ammonia Solution [sp. gr. 0·897 at 25° C. (77° F.)] added. After covering this mixture and digesting it for 15 minutes on a water-bath, it be rinsed upon a filter and washed with a little Water, the filtrate and washings after evaporating to dryness, moistening with 6 drops of Nitric Acid and again drying, should not respond to the Modified Gutzeit's test for Arsenic, *U.S.P.*; if the precipitated Sulphide remaining on the filter be treated with diluted Nitric Acid (1 in 4), warmed and then filtered, the filtrate should leave no weighable residue upon evaporation and gentle ignition, *U.S.P.*

Ammonium Sulphide.—If 2 grammes of the salt be shaken with 20 c.c. of Ether, filtered, the filtrate evaporated and 10 c.c. of Distilled Water added, 5 c.c. of the filtrate so obtained should not yield any change in colour on the addition of a few drops of T.S. of Ammonium Sulphide, *U.S.P.*

Preparations.

LOTIO HYDRARGYRI NIGRA. BLACK MERCURIAL LOTION.

B.P.Syn.—BLACK WASH.

Triturate 30 grains of Mercurous Chloride with ½ fl. oz. of Glycerin and 1¼ fl. oz. of Mucilage of Tragacanth; transfer to a bottle; add 2 fl. oz. of the Solution of Lime; shake well; add sufficient Solution of Lime to produce 10 fl. oz. of the Lotion.

(about 1 in 146)

Useful application to syphilitic sores, and to relieve itching, as in prurigo senilis and urticaria.

Foreign Pharmacopœias.—Official in Mex. (Agua Fagedenica Negra), 1 in 600. Not in the others.

PILULA HYDRARGYRI SUBCHLORIDI COMPOSITA. COMPOUND PILL OF MERCUROUS CHLORIDE. *B.P.Syn.*—COMPOUND CALOMEL PILL; PLUMMER'S PILL.

Mercurous Chloride, 1 oz.; Sulphurated Antimony, 1 oz.; Guaiacum Resin, in powder, 2 oz.; Castor Oil, 180 grains; Alcohol (90 p.c.), *q.s.* about 1 fl. drm. (1 in 4½)

Dose.—4 to 8 grains = 0·26 to 0·52 gramme.

UNGUENTUM HYDRARGYRI SUBCHLORIDI. MERCUROUS CHLORIDE OINTMENT. *B.P.Syn.*—CALOMEL OINTMENT.

Mercurous Chloride, 1; Benzoated Lard, 9. (1 in 10)

Useful in the itching of some skin affections, psoriasis and eczema, also in pruritus ani. A good application to syphilitic sores.

Foreign Pharmacopœias.—Official in Fr. (Pommade de Calomel), Ital. (Pomata di precipitato bianco), 1 in 10; Port. (Pomada de Mercurio Doce), 1 in 10; Mex. (Pomada de Cloruro Mercurioso), 1 and 20; Span. (Pomada de Cloruro Mercurioso Precipitado), 1 in 10. Not in the others.

Not Official.

CALOMEL CREAM (*Squire*).—Pure hydrosublimed Calomel, 48 grains; sterilised anhydrous Lanolin, by weight, 160 grains; pure sterilised Olive Oil, q.s. to produce 1 oz.

10 minims = 1 grain of pure hydrosublimed Calomel.

Dose.—10 minims = 0·6 c.c. by intramuscular injection.

Calomel, 10 grains; Vaseline to 1 oz.—*Lock.*
See also Mercurial Cream, p. 604.

EMPLASTRUM CALOMELANOS. *Syn.* EMPLASTRUM ALBUM.—Contains 20 p.c. of Calomel, spread on silk or other suitable material.

PASTILLI HYDRARGYRI CHLORATI CUM TALCO (JAP.).—Each pastil contains 0·5 gramme of Mercurous Chloride.

PILULA CALOMELANOS C. COLOC.—Calomel, 1 grain; Compound Extract of Colocynth, 3½ grains; Ipecacuanha, ½ grain.—*Middlesex.*

Dose.—One or two pills.

PILULA HYDRARGYRI SUBCHLORIDI ET JALAPÆ (House Pill).—Calomel, 1 grain; Jalap, 3 grains; Syrup of Glucose, *q.s.*; in one pill.—*St. Bartholomew's.*

PILULA HYDRARGYRI SUBCHLORIDI ET SCAMMONII.—Calomel, 1 grain; Scammony, 3 grains; Syrup of Glucose, *q.s.*; in one pill.—*St. Bartholomew's.*

PILULA ZITTMANN.—Calomel, 2 grains; Compound Extract of Colocynth, 5 grains; Extract of Henbane, 2 grains. Make two pills.—*Lock.*

Pilulæ Calomelanos et Colocynthidis et Hyoscyami. *Syn.* Zittmann's Pills.—Mercurous Chloride, 1 grain; Compound Extract of Colocynth, 2 grains; Green Extract of Hyoscyamus, 1 grain; to make one pill.—*B.P.C.*

PULVIS BASILICUS.—Mercurous Chloride, 3; Scammony, 3; Acid Potassium Tartrate, 3; Jalap, 1; Ginger, 1; Antimonial Powder, 1. *Dose* for a child of two years, 4 grains (0·26 gramme); of six years or upwards, 8 grains (0·52 gramme).—*Martindale.*

This has been incorporated in the *B.P.C.* under the title **Pulvis Hydrargyri Subchloridi Compositus.**

PULVIS RHEI CUM HYDRARGYRO.—Rhubarb Root, in powder, 2 grains; Mercurous Chloride, ½ grain; Ginger, in powder, ½ grain. *Dose* for a child of twelve months.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

This form is given in *London Ophthalmic* under the title **Pulvis Calomelanos cum Rheo.**

PULVIS CALOMELANOS ET ACIDI BORICI.—Mercurous Chloride, 1; Boric Acid, in powder, 3. Used as a dusting powder.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

PULVIS CALOMELANOS ET AMYLI.—Mercurous Chloride, 1; Starch Powder, 3. Used as a dusting powder.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

Mercurous Chloride, 1; Starch, 1.—*King's* and *Lock.*

PULVIS CALOMELANOS ET ZINCI OXIDI.—Mercurous Chloride, 1; Zinc Oxide, 3. Used as a dusting powder.—*St. Thomas's* and *London.*

This has been incorporated in the *B.P.C.*

HYDRARGYRUM AMMONIATUM.

AMMONIATED MERCURY.

B.P.Syn.—Ammonio-Chloride of Mercury; Mercuric-Ammonium Chloride White Precipitate.

NH_2HgCl, eq. 249·93.

White pulverulent masses or a white odourless powder, possessing a somewhat earthy and subsequently metallic taste. It is converted into a yellow basic salt by prolonged contact with Water.

It is known as *infusible white precipitate.*

The *fusible* variety is obtained by adding a solution of Mercuric Chloride to a mixture of Ammonium Chloride and Ammonia till the precipitate ceases to redissolve. It has the formula $HgCl_2 . 2NH_3$.

Solubility.—Soluble in Hydrochloric Acid. Insoluble in Water, Alcohol (90 p.c.) and Ether.

Medicinal Properties.—Never given internally. Used in the form of ointment for chronic and parasitic skin diseases, impetigo, herpes, ringworm and scabies. The ointment is used for pediculi, but the powder can be used alone or mixed with Rose Water, and the unpleasantness of greasing the linen avoided.

Official Preparation.—Unguentum Hydrargyri Ammoniati.

Not Official.—Lowndes' Cream.

Antidotes.—Stomach-tube or an emetic, preceded by raw eggs and raw flour and water.

Foreign Pharmacopœias.—Official in Austr. and Hung. (Hydrarg. Bichloratum Ammoniatum); Belg. (Præcipitatum Album); Dan., Norw. and Swed. (Chloretum Amido-Hydrargyricum); Dutch (Chloretum Hydrargyrico-ammonicum); Ger. and Jap. (Hydrargyrum Præcipitatum Album); Ital. (Cloramiduro di Mercurio); Russ. and Swiss (Hydrargyrum Amidato-bichloratum); U.S. (Hydrargyrum Ammoniatum); Ph. Lond. 1788 (Calx Hydrargyri Alba). Not in Fr., Port. or Span.

The synonyms, Fr., Précipité Blanc; Port. and Span., Precipitatum Album; apply to Calomel and *not* to Hydrargyrum Ammoniatum.

Tests.—Ammoniated Mercury volatilises when heated at a temperature below redness. When boiled with Stannous Chloride Solution it is reduced and turns grey, and produces globules of metallic Mercury. It is completely soluble in warm Acetic Acid and in Sodium Thiosulphate Solution. The solution in the latter reagent evolves Ammonia gas, and a precipitate of Red Mercuric Sulphide when boiled, which is converted into the black variety on prolonged boiling. Dissolved in diluted Nitric Acid it affords a scarlet precipitate with Potassium Iodide Solution. When heated with Potassium or Sodium Hydroxide Solution, it assumes a yellow colour and Ammonia gas is evolved. If the mixture be filtered, the filtrate, when acidified with diluted Nitric Acid, yields with Silver Nitrate Solution a white curdy precipitate, insoluble in Nitric Acid, readily soluble in Ammonia Solution. It is officially required to yield, when heated with an excess of Lime, from 78 to 79 p.c. of metallic Mercury, corresponding to 98·0 to 99·3 p.c. of pure Mercuric Ammonium Chloride. The *B.P.* 1885 required 77·5 p.c., corresponding to 97·4 p.c. of the pure salt. The *U.S.P.* requires that it should contain not less than 78 p.c. nor more than 80 p.c. of metallic Mercury, corresponding to not less than 98·0 p.c. nor more than 100·6 p.c. of the pure salt, but gives no method of determination. The *P.G.* does not refer to either a requisite percentage of metallic Mercury or to the methods of determination. It contains theoretically 79·5 p.c. w/w of metallic Mercury.

The more generally occurring impurities are fixed residue, Mercurous salts, Carbonate, foreign salts, Arsenic and other metals. The *B.P.* requires that it shall leave on volatilisation only an insignificant amount of fixed residue, both *U.S.P.* and *P.G.* require that it shall volatilise without residue. All three Pharmacopœias agree that it should not fuse. The absence of Mercurous salts and Carbonate is ensured by the specimen dissolving completely in Hydrochloric Acid without effervescence. Foreign salts may be detected by precipitating the Mercury as Sulphide with Hydrogen Sulphide, filtering and evaporating the filtrate to dryness, as described under Hydrargyri Subchloridum. The precipitated Mercury Sulphide contains any Arsenic which may have been present; the latter may be extracted by digestion with strong Ammonia Solution, and when treated as described under Hydrargyri Subchloridum may be detected by the modified Gutzeit's test. Metals other than Mercury, precipitable by Hydrogen Sulphide, may be detected by warming the precipitated Sulphide with diluted Nitric Acid and filtering, the filtrate on evaporation and ignition should leave no weighable residue.

Preparation.

UNGUENTUM HYDRARGYRI AMMONIATI. AMMONIATED MERCURY OINTMENT. *B.P.Syn.*—WHITE PRECIPITATE OINTMENT.

Ammoniated Mercury, 1; Paraffin Ointment, white, 9. (1 in 10)

Foreign Pharmacopœias.—Official in Dutch (Ung. Chloreti Hydrargyrico-ammonici), 1 in 10: Ger., Jap. and Swiss (Ung. Hydrargyri Album); and Russ. (Ung. Hydrargyri Amidato-bichlorati), 1 in 10; U.S., 1 in 10. Not in the others.

Not Official.

LOWNDES' CREAM.—Ammoniated Mercury Ointment, 1; Zinc Ointment, 3; Glycerin, 2; form a cream.

HYDRARGYRUM CUM CRETA.

MERCURY WITH CHALK.

P.B.Syn.—Grey Powder.

A dull grey powder, free from grittiness, made by thoroughly mixing 1 of Mercury with 2 of Prepared Chalk.

Solubility.—Insoluble in Water; partially soluble in diluted Hydrochloric Acid, and in diluted Acetic Acid; leaving a greyish residue of finely-divided Mercury.

Medicinal Properties.—Chiefly given to children as a cathartic; suitable for the prolonged administration of Mercury in syphilis.

Half a grain, combined with aromatic chalk powder, can usually be given three times daily in infantile syphilis, and if there is any loosening of the bowels Dover's powder may be given with the grey powder in doses of ⅛ grain for infants over three months of age, and ¼ grain at the age of six months (*L.* '04, ii. 1405).

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

Prescribing Notes.—*Best given as a* **powder** *by itself, or with Rhubarb; sometimes in* **cachets**; *but when required to be made into* **pills**, '*Diluted Glucose' is the best excipient.*

Not Official.—Pilula Hydrargyri cum Creta et Opio, Pilulæ Hydrargyri cum Creta et Ipecacuanhæ.

Foreign Pharmacopœias—Official in Jap. and Swed., same as Brit.; Mex., Polvo de Mercurio Calcareo, 1 in 2⅔; Port., Mercurio com Carbonato de Cal, 3 in 10; U.S., 3·8 in 10. Not in the others.

Tests.—Mercury with Chalk, when mixed with Water, acidified with diluted Hydrochloric Acid, and boiled with a bright strip of Copper foil, gives a grey deposit, which assumes a silvery lustre on being rubbed. It partially dissolves in Hydrochloric Acid with effervescence, and the evolved gas, if passed through Lime Water, yields a white precipitate; the resulting solution, when filtered from the deposit of Mercury, should not afford any white or grey precipitate on the addition of Stannous Chloride Solution, indicating the absence of Mercuric salts. The *U.S.P.* requires that the solution obtained by digesting 1 decigramme of the powder with 20 c.c. of warm diluted Hydrochloric Acid should yield a filtrate, which should be unaffected by Hydrogen Sulphide Solution. A limit of Mercurous oxide is fixed in the *U.S.P.* by the requirement that the filtrate obtained when the specimen is digested with warm Acetic Acid and filtered, should not become more than slightly opalescent on the addition of one or two drops of Hydrochloric Acid. The *B.P.* does not specify a necessary percentage of Mercury nor a method of determination.

Not Official.

PILULA HYDRARGYRI CUM CRETA ET OPIO.—*Syn.* Hutchinson's Pills. Mercury with Chalk, 1 grain: Compound Powder of Ipecacuanha, 1 grain.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

PILULÆ HYDRARGYRI CUM CRETA ET IPECACUANHÆ.—Mercury with Chalk, 1 grain; Compound Ipecacuanha Powder, 1 grain.—No. 1, *University.*

HYDRASTIS RHIZOMA.

HYDRASTIS RHIZOME.

Fr., Hydrastis; Ger., Hydrastisrhizom; Ital., Idraste; Span.,
Hidrastis del Canada.

The dried Rhizome and Roots of *Hydrastis Canadensis, L.*

Hydrastis contains the alkaloids—**Berberine** (3 to 4 p.c.), **Hydrastine** (2 to 3 p.c), and **Canadine.**

The Hydrastis of the *U.S.P.* is required to yield not less than 2·5 p.c. w/w of Hydrastine; neither that of *B.P.* nor the *P.G.* is required to yield a definite percentage of Hydrastine.

Medicinal Properties.—Hæmostatic, astringent. Useful in chronic catarrhal conditions of the mucous membranes, such as the gastro-intestinal, but especially that of the uterus. Recommended in menorrhagia.

The fluid extract is a sovereign remedy as a preventive in spontaneous epistaxis.—*M.A.* '95, 246. It may be used internally or as a 5 p.c. solution in water as a spray; internally also in aggravated cases of hyperidrosis.—*M.A.* '95, 322. Used locally in chronic pharyngitis.—*L.* '89, i. 549.

20 to 30 drops of the fluid extract for controlling night sweats.—*Pr.* lv. 624.

In chronic bronchitis.—*B.M.J.E.* '97, i. 84; '97, ii. 60; *Pr.* lx. 224.

Prescribing Notes.—*Equal parts of the Tincture and Water, or* 1 *of the Liquid Extract to* 19 *of Water forms a useful lotion.*

Official Preparations.—Extractum Hydrastis Liquidum and Tinctura Hydrastis.

Not Official.—Glyceritum Hydrastis, Hydrastin, Hydrastina, Hydrastinæ Hydrochloridum, Hydrastinina, Hydrastininæ Hydrochloridum.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Mex., Norw., Russ., Span., Swed., Swiss and U.S.

Descriptive Notes.—Hydrastis Rhizome is of a yellowish-brown colour, and the transverse fracture is hard and short, exhibiting a greenish-yellow, resinous surface in which a row of bright yellow, narrow, distant wood bundles form a ring. It has a characteristic odour, and a bitter taste. It is tortuous, simple or branched, ½ to 1½ inches (12 to 38 mm.) long and ⅛ to ½ inch (3 to 12 mm.) in thickness, *B.P.*; sub-cylindrical, oblique, with thin brittle roots, 2 to 5 cm. long, and 3 to 6 mm. in diameter, with short stem remnants, or stem scars, and slightly annulate, *U.S.P.* It is furnished with numerous brittle slender rootlets, except on the upper surface, which presents short, nearly erect branches, each with terminal cup-shaped scars where a stem has been given off.

Tests.—A useful method for the separate determination of Berberine and Hydrastine is given (*Y.B.P.* '01, 408; *C.D.* '01, ii. 235). A weighed quantity of 10 grammes of the drug in a state of fine powder is exhausted with hot Alcohol, either in a Soxhlet or in a flask fitted with a reflux condenser. The liquid is cooled and the volume adjusted to 100 c.c. by the addition of Alcohol. A measured quantity of 25 c.c. of this liquid is placed in a flask of about 8 oz. capacity mixed with 1½ c.c. of Hydrochloric Acid (32 p.c.), ¼ c.c. of Sulphuric Acid, and 125 c.c. of Sulphuric Ether. The mixture is cooled, well shaken, allowed to stand 24 hours in a refrigerator for the crystals of Berberine Hydrochloride to separate, and filtered through a weighed filter paper, the filtrate being reserved. The crystals are washed with a mixture of equal volumes of Alcohol and Ether until the washings cease to give an acid reaction, the washings being added to the main filtrate. The crystals are dried at 105° C. (221° F.) and weighed. The weight multiplied by 0·9017 and then by 40 gives the percentage of Berberine present in the sample operated on.

The filtrate and washings from the Berberine Hydrochloride crystals are rendered very nearly neutral or only faintly acid, evaporated nearly to dryness on steam-bath, the residue treated with hot Water in small quantities, filtering into a stoppered separator, until the washings from the residue cease to give an alkaloidal reaction with the ordinary test reagents. Sufficient Ammonia Solution is added to the aqueous extract in the separator to render it alkaline and the liberated alkaloid extracted by agitation with Ether. The Ether extraction is repeated until the whole of the Hydrastine is removed, the excess of Ether is removed by evaporation and the alkaloid extracted from its ethereal solution by several agitations with successive portions of a 5 p.c. Sulphuric Acid Solution. The separated acid liquids are mixed, sufficient Ammonia Solution added to render them alkaline and the Hydrastine extracted by repeated agitation with successive quantities of Ether. The Ether is evaporated, the alkaloidal residue dissolved in an excess of Twentieth-normal Volumetric Sulphuric Acid Solution, and the excess of Volumetric Acid Solution titrated with Hundredth-normal Volumetric Sodium or Potassium Hydroxide Solution. The number of c.c. of Hundredth-normal Volumetric Sodium Hydroxide Solution used, divided by 5 and subtracted from the number of c.c. of Twentieth-normal Volumetric Sulphuric Acid Solution employed to dissolve the alkaloidal residue, the product multiplied by 0·019016 and then by 40, yields the percentage of Hydrastine present in the sample.

The above process has been tried in the author's laboratory and found to work well. A sample of the Rhizome gave 3·6 p.c. of Berberine and 3·20 p.c. of Hydrastine.

The *U.S.P.* adopts a method for the determination of Hydrastine, which may be briefly outlined as follows:—A weighed quantity of 15 grammes of Hydrastis in No. 60 powder is shaken during 10 minutes, in an Erlenmeyer flask, with 150 c.c. of Ether. 5 c.c. of Ammonia Solution is added and the flask again shaken at intervals for half an hour. After the addition of 15 c.c. of Water to cause the drug to agglomerate, 100 c.c. of the clear Ether solution is removed to a separator and shaken with 15 c.c. of Normal Volumetric Sulphuric Acid Solution. The lower acid layer is removed to a second separator, and when the two liquids have separated, the Ether Solution is again shaken with 5 c.c. of Normal Volumetric Sulphuric Acid Solution and 5 c.c. of Water, the acid solution being again drawn off, when the liquids have separated. The Ether solution is then shaken with 5 c.c. of Water, which is in turn removed. The mixed acid and aqueous liquids are mixed with sufficient Ammonia Water to render the liquid alkaline and the liberated alkaloid shaken out with 25 c.c. of Ether. After separation of the liquids, the lower alkaline portion is drawn off and the Ether solution transferred to a tared flask. The extraction is repeated with two successive portions each of 20 c.c. and 15 c.c. of Ether, the alkaline liquid being removed in each case and the ethereal solution transferred to the tared flask. The Ether is removed by evaporation, the alkaloidal residue dried till constant in weight at 100° C. (212° F.), cooled and weighed. This weight multiplied by 10 gives the percentage of Hydrastine.

The ash of Hydrastis varies from 5 to 8 p.c. and should not exceed 10 p.c.

Preparations.

EXTRACTUM HYDRASTIS LIQUIDUM. LIQUID EXTRACT OF HYDRASTIS.

20 of Hydrastis Rhizome, exhausted by percolation with Alcohol (45 p.c.), reserving the first 17 and evaporating the remainder to a soft Extract which is dissolved in the first portion, and the whole made up with Alcohol (45 p.c.) to 20. (1 in 1)

The fluid extracts of the *U.S.P.*, *Fr.* and *P.G.* are standardised preparations, that of the *U.S.P.* is required to contain 2 p.c. w/v of Hydrastine, that of the two others 2 p.c. w/w.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Mex., Norw., Russ., Span., Swed., Swiss and U.S., all 1 in 1; Fr. and Mex. have a solid extract. Not in the others.

Shoemaker has used the fluid extract as a stimulant and astringent application in skin diseases.—*L.* '85, ii. 87.

Tests.—Fluid Extract of Hydrastic has a sp. gr. of 1·025 to 1·048; contains about 22 p.c. w/v of total solids and about 40 p.c. w/v of Absolute Alcohol.

The method adopted by the *U.S.P.* for the determination of the Hydrastine is essentially as follows:—A measured quantity of 10 c.c. of the Fluid Extract is introduced into a measuring flask of 100 c.c. capacity, together with 85 c.c. of Water containing in solution 2 grammes of Potassium Iodide. After the addition of sufficient Water to bring the volume of the liquids to 100 c.c., they are shaken for several minutes. A filtered measured quantity of 50 c.c. is rendered alkaline with Ammonia Water, and the liberated alkaloid shaken out with 30 c.c. of Ether, repeating the extraction with a further quantity of 20 c.c. of Ether. The lower alkaline liquid is in each case removed after complete separation, the Ether solution transferred to a tared flask, the mixed ethereal solutions evaporated at a gentle heat, the residue dried on the water-bath till constant in weight, cooled and weighed. This weight multiplied by 20 gives the percentage w/v of Hydrastine. The *U.S.P.* process works satisfactorily, and the alkaloid is obtained in a condition of purity. A sample of the *B.P.* liquid extract prepared and examined in the author's laboratory had a sp. gr. of 1·048; contained 22·2 p.c. w/v of total solids and 35·4 p.c. w/v of Absolute Alcohol. When assayed by the *U.S.P.* process it yielded 2·12 p.c. w/v of Hydrastine.

The essential details of the *P.G.* method for the determination of the Hydrastine content are as follows:—A weighed quantity of 15 grammes of the Fluid Extract is evaporated on a water-bath to about 5 grammes, the residue mixed with 10 c.c. of Water transferred to a flask, 10 grammes of Petroleum Ether, 50 grammes of Ether, and 5 grammes of Ammonia Solution added, and the mixture allowed to stand, with frequent intervals of shaking, for one hour. A weighed quantity of 50 grammes of the clear Ether solution is filtered into a separator, 10 c.c. of a mixture of 1 part of Hydrochloric Acid and 4 parts of Water added and the whole is shaken for a few minutes. After complete separation the acid layer is drawn off into a beaker, the ethereal solution is washed twice in succession with 5 c.c. of Water, to which a few drops of Hydrochloric Acid have been added, these washings being added to the main quantity in the beaker. The mixed acid liquids are rendered alkaline with Ammonia Solution, 50 grammes of Ether are added and the mixture allowed to stand for one hour, shaking frequently at intervals. A weighed quantity of 40 grammes is filtered through a dry filter paper into a dry tared flask, the Ether distilled off, and the residue dried at 100° C. (212° F.), cooled and weighed. It should amount to at least 0·2 gramme, corresponding to 2·0 p.c. w/w of Hydrastine.

TINCTURA HYDRASTIS. TINCTURE OF HYDRASTIS.

2 of Hydrastis Rhizome in No. 60 powder, percolated with Alcohol (60 p.c.) to yield 20.

Dose.—$\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Fr. and Ital., 1 and 5; Span., 1 in 10; U.S., 1 in 5. Not in the others.

Tests.—Tincture of Hydrastis has a sp. gr. of 0·920 to 0·930; contains about 2·5 p.c. w/v of total solids and about 58·0 p.c. w/v of Absolute Alcohol. The *B.P.* Tincture is not a standardised preparation. The *U.S.P.* 1 in 10 Tincture is required to contain 0·40 p.c. w/v of Hydrastine. The *P.G.* does not include a Tincture. The method of determination of the Hydrastine adopted by the *U.S.P.* is essentially as follows:—A measured quantity of 100 c.c. is concentrated by evaporation to about one-tenth its volume, sufficient Alcohol (94·9 p.c.) being added to dissolve any insoluble matter which may possibly have separated. The same method of determination is adopted for the assay of the resultant solution as for the assay of Fluidextractum

Hydrastis. In calculating the percentage of Hydrastine it must be taken into account that the weight of residue represents that from 50 c.c. of the Tincture, and must therefore be multiplied by 2 and not by 20 as in the case of the Fluid Extract.

A specimen of *B.P.* Tincture prepared in the author's laboratory yielded, when assayed by the *U.S.P.* process described above, 0·288 p.c. w/v of Hydrastine.

Not Official.

GLYCERITUM HYDRASTIS.—Moisten 100 of Hydrastis with 35 of Alcohol (95 p.c.)., pack it in a percolator, add enough Alcohol (95 p.c.) to saturate the powder and leave a stratum above it, macerating for 48 hours, continue percolation with more Alcohol until the Hydrastis is practically exhausted. Remove nearly all the Alcohol by distillation or evaporation, pour the thick concentrated liquid into 50 of ice-cold Water, and set it aside in a cold place for 24 hours, filter, pass enough cold Water through the filter to make the filtrate measure 50, add 50 of Glycerin and mix thoroughly. Average Dose, 30 minims.—*U.S.P.*

This has been incorporated in the *B.P.C.* under the title **Glycerinum Hydrastis,** with the *syn.* Glyceritum Hydrastis.

HYDRASTIN.—An eclectic remedy has been sold under this name for many years. It is an **extract** in fine powder, formerly prepared from Hydrastis Rhizome with Alcohol (60 p.c.), but now with Alcohol (90 p.c.). Care must be taken not to confound this with the alkaloid Hydrastine.

Dose.—2 to 6 grains = 0·13 to 0·4 gramme.

Considerable variation has been shown (*C.D.* '01, ii. 235) to exist among commercial specimens of Hydrastin. Six samples were examined, four American specimens, one manufactured by a reliable firm, by the *B.P.C.* (1901) process, and one from an unknown source. The percentage of Hydrastine varied from a trace in four of the preparations to 8·7 and 15·2 p.c. in the remaining two, and the Berberine from a trace in two of the preparations to 9·67, 16·53, 23·56, and 26·9 p.c. in the remaining four. The preparation made by the *B.P.C.* (1901) process contained traces of Hydrastine and Berberine. The following suggestions are made: that the name Hydrastin be changed to Extractum Hydrastis Siccum, that a stronger Alcohol be used for the extraction, and that the product be standardised to contain 10 p.c. of Hydrastine. The two former suggestions have been adopted in the *B.P.C.* (1907), but no standard is adopted, though a note at the end of the monograph mentions that it has been suggested that this extract should be standardised to contain 20 p.c. of total alkaloids, of which two-fifths should be Hydrastine.

HYDRASTINA. Hydrastine. $C_{21}H_{21}NO_6$, eq. 380·33.—An alkaloid crystallising in white glistening four-sided prisms.

It is obtained from the Rhizome and Roots of Hydrastis Canadensis.

A close relationship exists between Hydrastine and Narcotine. Schmidt considers that Narcotine contains three Methoxyl groups and Hydrastine only two. Both bases yield on oxidation Opianic Acid, which contains two Methoxyl groups. Cotarnine contains only one such group, it therefore follows that Hydrastine contains no Methoxyl, and that Cotarnine has the constitution of a Methyl-hydrastinine.

Solubility.—1 in 120 of Alcohol (90 p.c.); 1 in 83 of Ether; 1 in 2 of Chloroform; the last two solvents do not dissolve Berberine; insoluble in Water and Petroleum Ether.

Dose.—$\frac{1}{4}$ to $\frac{1}{2}$ grain = 0·016 to 0·032 gramme.

Hydrastine with Mono-calcium Phosphate forms a soluble compound which can be made to contain 71 p.c. of Hydrastine.—*A.J.P.* '97, 604; *P.J.* '98, i. 94.

Foreign Pharmacopœias.—Official in Fr. and U.S.

Tests.—Hydrastine melts at 132° C. (269·6° F.). It possesses an alkaline reaction towards moistened red Litmus paper. Its solution in Chloroform is lævogyrate, whilst the solution in diluted Sulphuric Acid is dextrogyrate. It dissolves in Sulphuric Acid without change of colour in the cold, but on heating a purple-violet colour is produced. Sulphuric Acid containing a trace of Molybdic Acid (Frohde's reagent) produces at first a green coloration, subsequently changing to brown. Sulphuric Acid containing a trace of Selenous Acid yields a yellowish-red colour, changing to a brown. Sulphuric Acid containing a trace of Nitric Acid gives a yellow to orange-red colour. Pure Nitric Acid yields an orange-coloured solution, depositing an insoluble substance on the addition of Water, the liquid exhibiting an intense blue fluorescence. When dissolved in Sulphuric Acid and brought into contact with a clear crystal of Potassium Bichromate a red colour changing to brownish is produced. The solution obtained by dissolving a crystal of the alkaloid in diluted Sulphuric Acid instantly decolorises Potassium Permanganate Solution, and an intense blue fluorescence is developed. An excess of Potassium Permanganate Solution must be avoided. It may be distinguished from Hydrastinine by the Potassium Permanganate Test described above. It may be distinguished from Berberine by giving no red coloration with Chlorine Water. It may be distinguished from Strychnine and Gelsemine by the instantaneous appearance of a bright red colour when a small portion of the precipitated Bichromate is touched with a drop of Sulphuric Acid. It should leave no weighable residue when ignited with free access of air.

HYDRASTINÆ HYDROCHLORIDUM. Hydrastine Hydrochloride. $C_{21}H_{21}NO_6 \cdot HCl$, eq. 416·52.—Pale yellow semi-crystalline powder.

It is very hygroscopic and should, therefore, be kept in well-closed glass bottles, preferably of an amber tint, in a cool atmosphere, and exposed as little as possible to contact with the air.

It contains theoretically 91·3 p.c. of Hydrastine.

Solubility.—About 1 in 1 of Water and about 1 in 1 of Alcohol (90 p.c.).

Dose.—½ to 1 grain = 0·032 to 0·065 gramme.

Has been used as an ecbolic to induce premature labour; maximum daily dose, 7½ grains internally, 5 grains by hypodermic injection.—*L.* '86, i. 990; its physiological action.—*B.M.J.* '98, ii. 1052.

Tests.—Hydrastine Hydrochloride melts at about 116° C. (240·8° F.). Its aqueous solution is neutral in reaction towards Litmus. The aqueous solution yields with Potassio-mercuric Iodide (Mayer's) Solution an amorphous yellowish-white precipitate; with Iodo-potassium Iodide (Wagner's) Solution, a deep brown flocculent precipitate; with Picric Acid Solution, a yellow amorphous precipitate; with Potassium Bichromate Solution, a yellow precipitate, soluble in excess of the reagent; with Potassium Ferrocyanide, a yellow precipitate, soluble in excess of the reagent. Hydrastine may be obtained by shaking out the aqueous solution rendered alkaline with Ammonia Solution, with Ether. The residue left on the evaporation of the Ether should respond to the tests given under Hydrastina. It should leave no residue when ignited with free access of air.

HYDRASTININA. Hydrastinine. $C_{11}H_{13}NO_3$, eq. 205·59.—This formula is that given in the *Fr. Codex* and in the best known text-books. The formula $C_{11}H_{11}NO_2$ appears in the *B.P.C.*

An oxidation product of the natural alkaloid Hydrastine. Colourless or light yellow crystals. Not readily soluble in Water; but soluble in Alcohol, Ether and Chloroform.

Foreign Pharmacopœias.—Official in Fr. and Mex.

Tests.—Hydrastinine has a m.p. of 116° to 117° C. (240·8° to 242·6° F.). With the majority of the mineral acids it forms salts soluble in Water. Its solution in diluted Hydrochloric Acid is optically inactive; it possesses a faint fluorescence and a very bitter taste. It may be distinguished from most other alkaloids by its powerful reducing action upon Potassio-mercuric Iodide (Nessler's) Solution, an immediate black precipitate being thrown down. Among the alkaloids, Morphine and Apomorphine appear to be the only ones acting in a similar manner, and among the glucosides, Picrotoxin. It should leave no weighable residue when heated with free access of air.

HYDRASTININÆ HYDROCHLORIDUM. Hydrastinine Hydrochloride.

$C_{11}H_{11}NO_2 \cdot HCl$, eq. 223·90.—Light yellow needle-shaped crystals, or a pale yellow crystalline powder. Soluble in its own weight of Water; 1 in 3 of Alcohol (90 p.c.).

It should be kept in well-closed bottles.

It contains theoretically 83·8 p.c. of anhydrous Hydrastinine.

Medicinal Properties.—Useful in endometritis, and uterine fibroid, in which excessive bleeding is a prominent symptom.—*L.* '90, i. 712; *T.G.* '90, 86; '92, 539, 699; *Pr.* xlv. 373. Valuable in menorrhagia.—*L.* '92, ii. 1350; *L.* 94, i. 1521.

Checks uterine hæmorrhage, ameliorates night sweats in phthisis. During labour it undoubtedly strengthens feeble contractions and revives an inert uterus. —*B.M.J.E.* '98, i. 63.

Dose.—½ to 1½ grains = 0·032 to 0·10 gramme, used **hypodermically** in a 10 p.c. aqueous solution.

Ph. Ger. maximum single dose, 0·03 gramme; maximum daily dose, 0·1 gramme.

Foreign Pharmacopœias.—Official in Belg., Fr., Ger., Swiss and U.S. Not in the others.

Tests.—Hydrastinine Hydrochloride melts at 212° C. (413·6° F.). The aqueous solution is neutral in reaction towards Litmus paper; it exhibits a strong blue fluorescence, especially when highly diluted. An aqueous solution affords with Bromine Water a yellow precipitate soluble to a colourless solution in Ammonia Solution; with Potassium Bichromate a yellow precipitate soluble on warming the solution, but again separating in glistening crystals when the solution cools; Ammonia Solution produces no precipitate or turbidity. 4 or 5 drops of Sodium Hydroxide Solution (15 p.c.) added to a solution of 0·1 gramme of the salt dissolved in 3 c.c. of Water produce after each addition a white turbidity, disappearing on shaking; on continued shaking or on stirring with a glass rod, pure white crystalline Hydrastinine separates out, the supernatant liquid shall be perfectly clear and not more than of a pale yellow colour.

Sulphuric Acid produces a deep yellow colour, Sulphuric Acid with a trace of Nitric Acid a reddish-brown colour, and Nitric Acid produces a deep yellow colour with the salt. It should leave no weighable residue when ignited with free access of air.

Not Official.

HYDROGENII PEROXIDUM.

H_2O_2, eq. 33·76.

In its purest condition this is a colourless liquid, sp. gr. 1·452, evolving when heated 475 times its volume of Oxygen gas. It is obtained by decomposing Barium Peroxide with Sulphuric Acid, and concentrating the filtered liquid in vacuo over Sulphuric Acid. Commercially it is sold containing 10 or 20 volumes of available Oxygen.

Perhydrol is stated to be a chemically pure Hydrogen Peroxide which, although it reddens Litmus strongly, is free from Acids.

Official Preparation.

LIQUOR HYDROGENII PEROXIDI. SOLUTION OF HYDROGEN PEROXIDE.

A colourless, almost odourless liquid, possessing a slightly acidulous taste, and producing a peculiar sensation and soapy froth in the mouth. It is an aqueous solution of Hydrogen Peroxide containing 9 to 11 volumes of available Oxygen, equivalent to about 3·0 p.c. by weight.

It may be prepared by the interaction at a temperature below 10° C. (50° F.) of Barium Peroxide, Water and a dilute mineral acid.

It appears as Aqua Hydrogenii Dioxidi in the *U.S.P.*

Medicinal Properties.—It parts with its Oxygen freely, and is a most powerful oxidising agent and disinfectant. It is a non-poisonous antiseptic. It does not precipitate albumen, and does not interfere with the action of Pepsin, Pancreatin, or Malt Extract. Used locally as a surgical dressing and for purulent discharges, and as a spray or swab in diphtheria. A spray of 10 volume strength is a good application to the throat in scarlet fever, and a 5 volume solution as a deodorising **gargle.** It is used for bleaching hair and delicate fabrics. It has been recommended internally in enteric fever, chronic bronchitis, and diabetes. It is not well adapted for hypodermic injection, because of the gas it evolves, although in cases of cyanide poisoning it is worth the risk of emboli.

Rapid healing of chancres by spray.—*M.A.* '95, 168.

As a spray in the treatment of lupus vulgaris and tubercular abscess.—*B.M.J.* '02, i. 448.

As a wash in the treatment of suppurative lesions of the skin.—*T.G.* '01, 639.

Injections of Oxygenated Water diluted with five times its volume of warm sterilised Water, and preceded by an evacuant injection, in the treatment of infantile dysentery.—*L.* '02, i. 392.

A bandage soaked with solution of Hydrogen Peroxide and allowed to dry on the wrist gave rise to spontaneous combustion. This was, no doubt, due to the solution containing Sulphuric Acid. The acid now used for its preservation is Phosphoric.

Dose.—$\frac{1}{2}$ to 2 fl. drm. = 1·8 c.c. to 7·1 c.c.

Should be well diluted.

Prescribing Notes.—*Solution of Hydrogen Peroxide does not keep well, but is liable to lose Oxygen even to the extent of half its strength in a year. Phosphoric Acid is the best preservative and is now generally added for that purpose. When gently warmed it gives off Oxygen very readily. Alcohol and Ether have been used to preserve it, and a solution in Ether is sold under the name* **Ozonic Ether,** *the usual strength of which is about equal to 4 volumes of Oxygen.*

Foreign Pharmacopœias.—Official in Austr. and Swiss (Hydrogenium hyperoxydatum Solutum); Belg. and Mex. (Agua Oxigenada), sp. gr. 1·452; Span. (Agua Oxigenada); U.S. (Aqua Hydrogenii Dioxidi). All contain 10 volumes of available Oxygen. Fr. (Soluté Officinal d'Eau Oxygénée); Ital. (Acqua Ossigenata), 12 volumes.

Tests.—Hydrogen Peroxide Solution has a sp. gr. of 1·014. At the ordinary temperature or more quickly when heated it evolves Oxygen. When mixed with an acidified Solution of Potassium Iodide, Iodine is instantly liberated. When mixed with Potassium Permanganate Solution acidified with Diluted Sulphuric Acid a brisk evolution of Oxygen ensues, the Permanganate at the same time being decolorised. A blue coloration appears at the junction of the two fluids, when a few drops of the Peroxide Solution are agitated with 10 c.c. of Water containing 10 drops of diluted Sulphuric Acid Solution and a drop of Potassium Chromate Solution and a few drops of Ether, the Ether also, after shaking, assuming a blue colour. It is officially required to afford at normal temperature and pressure not less than 18 nor more than 22 volumes of Oxygen, corresponding to about 3·0 p.c. w/w of absolute Hydrogen Peroxide. The *B.P.* method of determination is a gasometric one, carried out with a mixture of 2 volumes of 5 p.c. Potassium Permanganate Solution, one volume of Sulphuric Acid and 7 of Water. When 1 volume of the Peroxide Solution is shaken with 10 to 12 volumes of such a mixture the quantity of Oxygen indicated above should be liberated, the gas is measured at the normal temperature and pressure. In the reaction which ensues, double the volume of Oxygen is evolved, half being derived from the Permanganate and half from the Peroxide Solution. The Permanganate method, gasometrically applied, has been subject to some unfavourable criticism and is generally considered as in all cases unreliable.

A suggestion has been made (*C.D.* '01, ii. 222; *P.J.* '01, ii. 131; *J.C.S. Abs.*, '01, ii. 686) to use a saturated Magnesium Sulphate Solution in the place of the Brine Solution, officially recommended, the latter having been proved to evolve Chlorine in the presence of Sulphuric Acid and Potassium Permanganate Solution, and to thus account for the discordant results obtained by the official process. Confirmation of the accuracy of the Kingzett Thiosulphate process given below is also yielded.

The *U.S.P.* employs the Potassium Permanganate method volumetrically as mentioned below. Each c.c of Tenth-normal Volumetric Potassium Permanganate Solution corresponding to 0·1 p.c. w/w of absolute Hydrogen Dioxide or 0·329 volume of Oxygen. The *U.S.P.* requirements are that to be of full strength it shall contain 9·87 volumes of Oxygen, corresponding to 3·0 p.c. w/w of absolute Hydrogen Peroxide. A method simple, rapid and accurate, which has been used extensively in the author's laboratory, is that of Kingzett. Its accuracy is, moreover, not lessened by the presence of the usual preservative agents. A measured quantity of 10 c.c. of the Peroxide is mixed with 40 c.c of a diluted Sulphuric Acid (1·3 sp. gr.) and made up to 100 c.c. with Water. A measured quantity of 10 c.c. of this solution is then run into 10 c.c. of a 10 p.c. Potassium Iodide Solution; the mixture allowed to stand for 5 minutes and titrated with Volumetric Sodium Thiosulphate Solution. 1 c.c. of the Volumetric Thiosulphate Solution is equivalent to 1·118 c.c. of Oxygen, but the figure must be divided by 2 to ascertain the number of volumes of available Oxygen.

The more generally occurring impurities are Barium, solid residue, excess of free acid, Arsenic, heavy metals, Hydrofluoric Acid. The *B.P.* recognises Barium and solid residue as likely impurities, but includes no tests for the remaining substances. It is officially required to yield no characteristic reaction with the tests for Barium, and to yield when evaporated to dryness on a water-bath not more than 0·5 p.c. of solid residue. The *U.S.P.* requires that no turbidity or precipitate should be produced on the addition of a few drops of diluted Sulphuric Acid to 10 c.c. of the Peroxide Solution; that it shall leave not more than 0·15 p.c. w/v of total solids as determined by evaporating 20 c.c. to dryness upon a water-bath and drying the residue at 120° C. (248° F.). The *U.S.P.* fixes the limit of free acids at 0·048 p.c. w/v calculated as Sulphuric Acid. Solutions which have been held in stock some time show a marked increase in the percentage w/v of acidity. Arsenic may be detected by evaporating the Peroxide Solution with an equal volume of Ammonia Solution and applying the modified Gutzeit's test; heavy metals and Hydrofluoric Acid by the tests described below. The inclusion of a test for the latter acid in the *B.P.* has been recommended.

The solution is not official in the *P.G.*

An investigation (*C.D.* '99, ii. 213, 240; *P.J.* '99, ii. 100, 115) showed that the most suitable bottles for the preservation of Hydrogen Peroxide Solution were champagne bottles and soda-water bottles. The effect of such shaking and vibration as specimens would be subjected to in daily transit is also reported upon. Any angular inequality of a bottle hastens decomposition, as also do the small rough patches of Iron Oxide frequently found on stone bottles. If kept in corked bottles, care should be taken that the bottles are not laid on their side, as contact with the cork hastens decomposition.

Gutzeit's Test.—The residue obtained on evaporating to dryness on a water-bath a mixture of 1 c.c. of the solution and 1 c.c. of Ammonia Water should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Time-limit Test.—The residue obtained by evaporating 1 c.c. to dryness on a water-bath, when dissolved in a mixture of 9 c.c. of Water and 1 c.c. of diluted Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Sodium Hydroxide and Sulphuric Acid.—If 50 c.c. of the solution be rendered alkaline by Sodium Hydroxide T.S. and evaporated to dryness on a water-bath, and the residue transferred to a watch-glass, moistened with Sulphuric Acid, and allowed to stand for a few hours in a moderately warm place, the surface of the glass after being washed should show no sign of corrosion, indicating the absence of Hydrofluoric Acid, *U.S.P.*

Volumetric Determination of Free Acid.—If to 25 c.c. of the solution 5 c.c. of Tenth-normal Volumetric Potassium Hydroxide Solution be added and the mixture be evaporated to about 10 c.c. and 3 drops of Phenolphthalein T.S. be added, not less than 2·5 c.c. of Tenth-normal Volumetric Solution of Sulphuric Acid should be required to discharge the red colour of the solution after continued boiling, *U.S.P.*

Volumetric Determination.—A measured quantity of 10 c.c. of the solution is diluted with sufficient Distilled Water to measure 100 c.c. A measured quantity of 16·9 c.c. of this liquid is transferred to a beaker, mixed with 5 c.c. of diluted Sulphuric Acid, and Tenth-normal Volumetric Potassium Permanganate Solution added from a burette with constant stirring until a faint pink tint is just retained. Each c.c. of the Tenth-normal Volumetric Solution represents 0·1 p.c. absolute Hydrogen Dioxide or 0·329 volume of Oxygen. If the solution be of full strength, 30 c.c. of Tenth-normal Volumetric Potassium Permanganate Solution will be required, *U.S.P.*

Not Official.

GUTTÆ HYDROGENII PEROXIDI.—Hydrogen Peroxide 10 volumes.—*Throat.* Two or three drops to be poured into the ear, for fetid discharges.

Not Official.

HYGROPHILA.

The dried Herb and Root of *Hygrophila spinosa*, T. And., is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

HYOSCYAMI FOLIA.

HYOSCYAMUS LEAVES.

B.P.Syn.—HENBANE LEAVES.

FR., JUSQUIAME NOIRE; GER., BILSENKRAUTBLATTER; ITAL., GIUSQUIAMO; SPAN., BELENO.

The fresh Leaves, Flowers and Branches of *Hyoscyamus niger*, L.; also the Leaves and the Flowering Tops, separated from the branches and carefully dried. Collected from the flowering biennial plants.

The dried leaves and flowering tops collected from plants of the second year's growth are alone official in the *U.S.P.* The official leaves are not required to yield a definite percentage of mydriatic alkaloids; those of the *U.S.P.* are required to yield not less than 0·08 p.c. The herb is official in the *P.G.*, but no definite percentage of mydriatic alkaloids is required.

Medicinal Properties.—Sedative, antispasmodic. Similar in action to Belladonna and Stramonium, but milder. Used in insomnia when Opium, from its constipating and other objectionable properties, is not advisable. It is employed to diminish pain and allay irritability of the bladder, and to prevent the griping of purgative medicines, whilst it increases the peristaltic action; in visceral neuralgias and in asthma and all spasmodic affections; to allay the irritation of teething and prevent convulsions. Children bear Hyoscyamus well, the aged not so. In large doses it dilates the pupil. **Hyoscine** is much employed in maniacal delirium.

As a hypnotic Hyoscyamus has largely given way (*B.M.J.* '05, ii. 1005) to its alkaloid Hyoscine. Hyoscyamine is practically devoid of sleep-bringing properties.

Ph. Ger. maximum single dose, 0·4 gramme; maximum daily dose, 1·2 grammes.

Incompatibles.—Vegetable Acids, Silver Nitrate, Lead Acetate, Liquor Potassæ or Sodæ.

Official Preparations.—Extractum Hyoscyami Viride, Succus Hyoscyami, and Tinctura Hyoscyami; used in the preparation of Hyoscinæ Hydrobromidum, and Hyoscyaminæ Sulphas. The **extract** is contained in Pilula Colocynthidis et Hyoscyami.

Not Official.—Hyoscyami Radix, Chloroformum Hyoscyami, Huile de Jusquiame Composée, Linimentum Hyoscyami, Oleum Hyoscyami, Oleum Hyoscyami Compositum, Oleum Hyoscyami Infusum, Constant Tincture of Hyoscyamus (*Squire*), Tinctura Hyoscyami Radicis, Hyoscyamina, and Hyoscina (Scopolamine).

Antidotes.—The same as for Belladonna.

Foreign Pharmacopœias.—Official in Austr., Dutch, Hung., Ital. (Giusquiamo), Jap., Russ., Swed., Swiss and U.S., **Leaves**; Ger. **Herb**; Belg., Dan., Fr. (Jusquiame noire), Norw., Port. (Meimendro), Mex. (Beleno Negro), and Span. (Beleno), **Leaves and Seeds.**

The *Brussels Conference* agreed to use only the leaf.

Descriptive Notes.—Henbane Leaves occur in commerce in various forms. The dried flowering shoots are known as biennial Henbane, and the first year's large autumnal leaves are sold as annual Henbane. German Henbane consists of the flowering tops of the small annual form of the plant, which is usually produced from the last formed seeds, and a certain amount of it is usually found in fields of the biennial form. These seeds produce weak plants which flower the first year. It has small leaves, and usually flowers are present, but the drug is less carefully dried than the English plant. Formerly a very superior preparation of the dried flower and leaves of the flowering shoots, with the stalks and mid-ribs removed, was sold, but is not at present obtainable. The official drug consists both of fresh leaves and flowers with the branches to which they are attached, and also of the leaves and the flowering tops separated from the branches, collected from the biennial plant, carefully dried. The leaves of the biennial plant are sessile or nearly so, the stalked root leaves decaying as a rule before the plant flowers. The sessile flowers are cup-shaped or irregularly rotate, yellowish with purple veins, and are subtended by large leafy bracts. The fruits open transversely and are two-celled, with numerous seeds attached to axile placentæ. The leaves are oblong ovate or triangular ovate, and sinuate in the broad-leaved form of the plant and oblong and pinnatifid in the narrow-leaved form. The stout veins and the under surface are furnished with long, clammy, glandular hairs, and the whole plant when fresh has a strong, somewhat unpleasant, but characteristic odour and a slightly acrid taste. Recently the leaves and stalks of *Hyoscyamus muticus*, L., have been imported from Egypt. They contain more Hyoscyamine than those of *H. niger*, for which they should therefore not be substituted, but the plant will not flourish in this country. Henbane Leaves in fragments or in powder may be recognised by the small prismatic crystals of Calcium Oxalate (0·010 mm. in diameter, *U.S.P.*), the 3 to 4 celled hairs with a bicellular or pluri-cellular gland at the apex, and by the stomata being surrounded by 3 to 4 cells, of which one is smaller than the others.

Tests.—Hyoscyamus Leaves dried at 100° C. (212° F.) contain from 0·06 to 0·15 p.c. of mydriatic alkaloids. The *U.S.P.* method of determination resembles that given under Belladonna Folia, except that in the place of 10 grammes of the powdered Belladonna Leaves, 25 grammes of Hyoscyamus Leaves in No. 60 powder are employed, and instead of 50 c.c. of a mixture containing 4 parts by volume of Ether and 1 part by volume of Chloroform, a measured quantity of 100 c.c. of a mixture of similar composition is employed. No method of determination is given in the *P.G.* The ash of the Leaves varies from 8 to 12 p.c. and should not exceed the latter figure.

Preparations.

EXTRACTUM HYOSCYAMI VIRIDE. GREEN EXTRACT OF HYOSCYAMUS.

A soft Extract, prepared from the juice expressed from fresh Henbane, the albuminous matters being separated at 93·3° C. (200° F.) and rejected.

Dose. 2 to 8 grains = 0·13 to 0·52 gramme.

Ph. Ger. maximum single dose, 0·1 gramme; maximum daily dose, 0·3 gramme.

It is generally used in smaller doses in **pills** to prevent the griping action of aperients.

Foreign Pharmacopœias.—Official in Austr. and Belg., alcoholic from **dried Leaves**; Dan., Norw. and Swed., made from **Leaves** with weak spirit; Dutch and Fr., alcoholic from **dried Leaves**; Ger. and Jap., made with Water and Spirit from **fresh Herb**; Hung., juice from **fresh Leaves,** freed from Albumen and evaporated to a thick fluid, equal parts of Spirit added, filtered and again evaporated; Ital., from **dried Leaves** with dilute Alcohol; Mex., from **dried Leaves** and dilute Alcohol, also **Fluid Extract**; Port., aqueous from **dried Leaves,** also from **fresh Leaves** with Alcohol; Russ., made from **Leaves** with Water and Spirit; Span., alcoholic from **dried Leaves**; Swiss, from **dried Leaves** with dilute Spirit; U.S., alcoholic extract from the **dried Leaves,** also **Fluid Extract** from the same.

The *Brussels Conference* agreed to prepare a solid extract (containing about 10 p.c. of Water) by means of Alcohol (70 p.c.).

Tests.—The Green Extract of Hyoscyamus of the *B.P.* is not a standardised preparation. The *U.S.P.* Extract is required to contain not less than 0·3 p.c. of mydriatic alkaloids, the Extract, if stronger than this, being diluted with powdered Milk Sugar. The *P.G.* Extract is required to yield at least 0·7 p.c. of alkaloids. The method adopted by the *U.S.P.* is similar to their method for the determination given under Extractum Belladonnæ Viride, with the exception that, in this instance, a weighed quantity of 10 grammes of the Extract is employed instead of the 5 grammes used in the case of the Belladonna Extract. In calculating the percentage of mydriatic alkaloids the result of the volumetric test is multiplied by 10 instead of by 20.

The *P.G.* method of determination is essentially as follows:—A weighed quantity of 2 grammes of the Extract is dissolved in a beaker in 5 grammes of Water and 5 grammes of Absolute Alcohol. 50 grammes of Ether and 20 grammes of Chloroform are added to this solution and, after a vigorous shaking, 10 c.c. of a 1 in 3 w/w Sodium Carbonate Solution. The mixture is allowed to stand for one hour, with frequent intervals of vigorous shaking. A weighed quantity of 50 grammes is then filtered through a dry, well-covered filter paper into a flask and about half is distilled. The remaining Ether-Chloroform solution is transferred to a separator. The flask washed with 3 successive portions each of 5 c.c. of Ether and the combined fluids shaken with 10 c.c. of Hundredth-normal Volumetric Hydrochloric Acid Solution. When the liquids have completely separated sufficient Ether is added to cause the Chloroform-Ether solution to float on the surface of the acid liquid, and the latter is filtered through a filter paper moistened with Water into a white glass flask of about 200 c.c. capacity. The Chloroform-Ether solution is shaken with three successive quantities each of 10 c.c. of Water, the washings being filtered through the same filter, the latter is washed with Water and the combined fluids are diluted with Water to 100 c.c. After the addition of sufficient Ether to form a layer of about 1 cm., 5 drops of Iodeosin Solution are added and Hundredth-normal Volumetric Potassium Hydroxide Solution added until the lower aqueous layer assumes a pale rose coloration, the mixture being shaken after each addition. To produce this colour not more than 6·5 c.c. of the Volumetric Potassium Hydroxide Solution should be necessary.

SUCCUS HYOSCYAMI. Juice of Hyoscyamus.

3 of the juice, expressed from fresh Henbane, mixed with 1 of Alcohol (90 p.c.) to preserve it.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

TINCTURA HYOSCYAMI. Tincture of Hyoscyamus.

1 of Hyoscyamus Leaves and Flowering Tops in No. 20 powder, percolated with Alcohol (45 p.c.), to yield 10. (1 in 10)

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

Much larger doses, 4 fl. drm. = 14·2 c.c., have been given in insomnia.

Foreign Pharmacopœias.—Official in Belg., Dutch, Fr., Span. and U.S., 1 in 10; Port., 1 and 5, also fresh Herb and Alcohol, equal weights; Mex., 1 in 5 from Leaves, also 1 in 5 from Seeds; also Ethereal, 1 in 5. All by weight except U.S.

The *Brussels Conference* agreed to a strength of 10 p.c., prepared by percolation with Alcohol (70 p.c.).

Tests.—Tincture of Hyoscyamus has a sp. gr. of 0·950 to 0·955, contains from about 2·5 p.c. w/v of total solids and about 45 p.c. w/v of Absolute Alcohol. The *B.P.* is not a standardised preparation. The *U.S.P.* Tincture is required to contain 0·007 p.c. w/v of mydriatic alkaloids. The method of determination adopted by the *U.S.P.* is virtually that employed for the assay of the Fluid Extract of Belladonna. A measured quantity of 100 c.c. of the Tincture is evaporated on a water-bath to about one-tenth its volume, sufficient Alcohol (94·9 p.c.) is added to dissolve any separated substance and the resulting liquid is assayed by the process described under Extractum Belladonnæ Liquidum. In calculating the result of the volumetric determination the final multiplication by 10 is unnecessary.

Constant Tincture of Hyoscyamus (*Squire*).—A Tincture of Hyoscyamus standardised to contain 0·01 p.c. w/v of mydriatic alkaloids, and forming one of the series of Constant Tinctures introduced by Squire in 1883. It has a sp. gr. of about 0·960, contains about 2·5 p.c. w/v of total solids and about 44·5 p.c. w/v of Absolute Alcohol. A sample of *B.P.* '98 Tincture prepared and assayed in the author's laboratory had a sp. gr. of 0·955, contained 2·64 p.c. w/v of total solids, 44·5 p.c. w/v of Absolute Alcohol, and yielded 0·01 p.c. w/v of mydriatic alkaloids.

HYOSCINÆ HYDROBROMIDUM and **HYOSCYAMINÆ SULPHAS.** *See* separate headings.

Not Official.

HYOSCYAMI RADIX.—The dried Root of *Hyoscyamus niger* (biennial) collected in the spring. Introduced by Peter Squire in 1878. Contains on the average about 0·15 p.c. of total alkaloid.

Chloroformum Hyoscyami, Linimentum Hyoscyami, and **Tinctura Hyoscyami Radicis,** are prepared on similar lines to the corresponding preparations of Belladonna.

OLEUM HYOSCYAMI.—Hyoscyamus Leaves, 4; Alcohol (90 p.c.), 3; Olive Oil, 40. The leaves are macerated several hours with the Alcohol, then mixed with the Olive Oil and warmed on the water-bath till the Alcohol is dissipated.—*Ger.*

Foreign Pharmacopœias.—Official in Austr. (Oleum Hyoscyami foliorum coctum), Leaves 100, Alcohol 75, Ammonia 2, Sesame Oil 1000; Belg. (Hyoscyami Oleum), Leaves 100, Alcohol 200, Oleum Officinale 1000; also (Hyoscyami Oleum Compositum), Lavender Oil 1, Peppermint Oil 1, Oil of Rosemary 1, Oil of Thyme 1, Hyoscyamus Oil 996. Dutch (Infusum Hyoscyami Oleosum), Leaves 25, Alcohol 50, Ammonia 1, Sesame Oil 250. Fr. (Huile de Jusquiame), dried Leaves 1, Alcohol (95 p.c.) 1, Poppy Oil 10; Jap. (Oleum Hyoscyami), Leaves 4, Alcohol 3, Olive Oil 40. Norw. and Swed. (Oleum Hyoscyami Infusum), Leaves 50, Alcohol 100, Ammonia 1, Sesame Oil 250. Russ. (Oleum Hyoscyami), dried Leaves 4, Alcohol (90 p.c.) 3, Sesame Oil 24. Span. (Aceite de Beleno), fresh Leaves 5, Olive Oil 10. Swiss (Oleum Hyoscyami), Leaves 10, Alcohol 10, Ammonia 2, Sesame Oil 100; also (Oleum Hyoscyami Compositum) (*Syn.* Balsamum Tranquilli) same as Belg.

The majority of the above work out about 1 of Leaves in 10 of product.

HUILE DE JUSQUIAME COMPOSÉE. (Baume Tranquille. (Fr.).—Dried Leaves of Belladonna, Henbane, Black Nightshade, Poppy and Stramonium, of each 5; Oils of Lavender, Peppermint, Rosemary and Thyme, of each 1; Alcohol (95 p.c.), 200; Poppy Oil, 5000.

Moisten the powdered leaves with the Alcohol, and digest on a water-bath for 24 hours, add the Poppy Oil and heat for 6 hours at 60° to 70° C., stirring occasionally; express; allow to settle, and decant; add the Oils and filter.

Oleum Hyoscyami Infusum.—Hyoscyamus Leaves, in No. 40 powder, 20; Alcohol (95 p.c.), 15; Ammonia Water (*U.S.P.*), 0·4; Lard Oil, 50; Cotton Seed Oil, 50.

Moisten the powder with Alcohol and Ammonia previously mixed, pack tightly and cover well, and macerate for 24 hours; add 12 of mixed oils, digest with agitation for 12 hours at a temperature between 50° and 60° C., strain and express. To the residue add the remainder of the Oils, digest and express as before and mix the expressed portions.—*U.S.N.F.*

This process is a modification of that prescribed by the *Ger. Ph.* and may be used for similar Infused Oils.

Oleum Hyoscyami Compositum. *Syn.* Balsamum Tranquillans.—Oils of Absinth, Lavender, Rosemary, Sage, Thyme, of each 2 drops; Infused Oil of Hyoscyamus (*N.F.*) 100 c.c.—*U.S.N.F.*

HYOSCYAMINA. Hyoscyamine. $C_{17}H_{23}NO_3$, eq. 287·05.—A crystalline alkaloid obtained from the Seeds of *Hyoscyamus niger*, the Root of *Scopola carniolica*, and probably other allied plants, isomeric with Atropine but not identical with it.

It occurs as white needle-shaped crystals. Only slightly soluble in Water, but freely in Alcohol (90 p.c.), in Chloroform, and in Ether. Probably constitutes the greater portion of the crystallisable alkaloid naturally existing in all the mydriatic drugs, and best obtained from the Root of Scopola or Belladonna. Most of the commercial 'Atropine' consists principally of Hyoscyamine.

The salts used in medicine are the **Hydrobomide** and **Sulphate**.

Dose.—$\frac{1}{120}$ to $\frac{1}{60}$ grain = 0·0005 to 0·001 gramme.

Hager, maximum single dose, 0·005 gramme; maximum daily dose, 0·015 gramme.

Tests.—Hyoscyamine melts at 108·5° C. (227·3° F.). Its solutions in neutral solvents are alkaline in reaction towards Litmus Solution and lævogyrate. It forms with Auric Chloride Solution a Gold double salt melting at 160° to 162° C. (320° to 323·6° F.). It dissolves in Sulphuric Acid without change of colour, and no alteration in colour should occur on the addition of one or two drops of Nitric Acid. It should leave no residue when ignited with free access of air.

HYOSCINA. Scopolamine, Hyoscine. $C_{17}H_{21}NO_4H_2O$, eq. 318·81.—An alkaloid which is found in *Hyoscyamus niger*, and various species of *Scopola*. It now represents what was formerly used in medicine under the name 'Amorphous Hyoscyamine.' It is usually employed medicinally in the form of **Hydrobromide**, **Hydrochloride**, and **Hydriodide**.

Foreign Pharmacopœias.—Official in Mex.

It forms transparent moderate-sized crystals or a colourless transparent glassy mass. It is slightly soluble in Water, readily soluble in Alcohol (90 p.c.), Ether, Chloroform and diluted acids.

Tests.—Crystalline Hyoscine, when dry, melts at 59° C. (138·2° F.). When dried over Sulphuric Acid the crystals lose in weight and change to a colourless amorphous glassy-looking mass which will not recrystallise. Its faintly acidified solution gives with Potassio-mercuric Iodide (Mayer's) Solution a yellowish-white precipitate; with Mercuric Chloride Solution a white precipitate; with Picric Acid a yellow crystalline precipitate. Tannic Acid produces no precipitate. Auric Chloride Solution added to a solution of Hyoscine faintly acidified with Hydrochloric Acid yields a yellow precipitate which, recrystallised from Water, yields brilliant yellow, glistening needles, which melt at 212° to 214° C. (413·6° to 417·2° F.). It leaves no weighable residue when ignited with free access of air.

HYOSCINÆ HYDROBROMIDUM.

HYOSCINE HYDROBOMIDE.

B.P.Syn.—HYDROBROMATE OF HYOSCINE; SCOPOLAMINE HYDROBROMIDE.

$C_{17}H_{21}NO_4$, HBr, $3H_2O$, eq. 434·92.

FR., BROMHYDRATE D'HYOSCINE; GER., SCOPALAMINHYDROBROMID;
ITAL., BROMHIDRATO DE SCOPOLAMINA.

Colourless, transparent, rhombic crystals, permanent in the air. A similar description is common to the *B.P.* and *U.S.P.*

It is the Hydrobromide of an alkaloid, Hyoscine (Scopolamine) obtained from Hyoscyamus, various species of Scopola and other plants of the Solanaceæ.

It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from the light.

Atroscine, the crystalline variety of Hyoscine, forms a crystalline **Hydrobromide.**

Solubility.—1 in 4 of Water; 1 in 14 of Alcohol (90 p.c.); very slightly soluble in Chloroform or Ether.

B.P. states it is 'soluble in one part of cold Water,' which is incorrect; 1 in 4 is more nearly so.

Medicinal Properties.—Hypnotic and sedative. Highly recommended in all forms of violent mania and cerebral excitement.

Given by the mouth it appeared (*M.P.* '05, i. 645) to be of great benefit in acute mania, giving quiet sleep, whereas by hypodermic injection it caused an alarming degree of depression.

In paralysis agitans (*B.M.J.E.* '05, ii. 44), 0·2 to 0·3 mgr., either in pill or in solution. In certain cases of senile pruritus it was of value in doses of 0·3 to 0·5 mgr. daily. In spasmodic asthma it was administered in large doses (0·25 to 0·5 centigramme) subcutaneously with Caffeine, with very great relief. In acute mania hypodermic injection resulted in eight or nine hours' sleep, with consequent inprovement in the general mental state.

The racemic form seemed (*B.M.J.* '05, ii. 250) to be less liable to produce untoward effects as a hypnotic, and was of equal hypnotic value, but Hyoscyamine and Hyoscine should be used with caution.

Exists in two forms (*B.M.J.* '05, ii. 1005), one of which is optically active (lævorotatory), whilst the other is indifferent to the ray of polarised light or racemic. The two have the same effect as hypnotics, but the racemic form has only half the action of the lævorotatory base on the pupil, glands and heart.

Scopolamine the best of all sedatives in the vomiting of pregnancy.—*B.M.J.E.* '07, ii. 27.

1000 confinements conducted with its assistance.—*B.M.J.E.* '07, ii. 10.

In epileptic attacks of an hysterical form.—*M.A.* '95, 244.

As a mydriatic (1 grain to 1 oz.), in cases where Atropine is undesirable.—*B.M.J.* '94, ii. 598.

Incipient acute mania arrested by a single injection of $\frac{1}{100}$ grain.—*B.M.J.* '97, ii. 652.

In mania, $\frac{1}{100}$ grain hypodermically and after forty minutes $\frac{1}{200}$ grain by the mouth to procure seven hours' sleep, followed after an interval of two days by a dose of $\frac{1}{66}$ grain hypodermically to induce a ten hours' sleep; Sodium Bromide in drm. doses being administered during the interval and for two days after the second sleep until 2 oz. in all had been taken.—*B.M.J.* '03, i. 74.

In the palliative treatment of paralysis agitans, it is probably the most useful drug that has hitherto been tried, $\frac{1}{200}$ to $\frac{1}{150}$ grain in solution in Chloroform Water, administered by the mouth. Great caution required as regards the dose, and it is well not to begin with more than $\frac{1}{150}$ or $\frac{1}{100}$ grain. $\frac{1}{75}$ grain given two or three times a day (by the mouth), for long periods without noting any bad effects.—*Pr.* lxiv. 410.

In exophthalmic goitre, $\frac{1}{800}$ grain.—*M.A.* '02, 280.

Two cases of paralysis agitans treated with Hydrobromide, at first hypodermically, the dose being gradually increased from $\frac{1}{250}$ to $\frac{1}{120}$ grain, injected once a day. Subsequently administered in $\frac{1}{150}$ grain doses dissolved in Chloroform Water, given twice daily by the mouth, gradually increasing the dose up to $\frac{1}{96}$ grain.—*L.* '02, i. 1907.

Hyoscine is more sedative and more reliable as a hypnotic than Hyoscyamine; indeed, it has almost totally replaced it for this purpose. There can be little doubt, moreover, notwithstanding the many ill effects attributed to the use of Hyoscine (Scopolamine), and to its variable action, that as a hypnotic it has come to stay. Its solubility in Water and its applicability to hypodermic medication make it of extreme value in many conditions, particularly in the insane.—*L.* '99, ii. 142.

$\frac{1}{100}$ grain, and subsequently $\frac{1}{200}$ grain, every thirty minutes to one hour, for from twenty-four to forty-eight hours, until the patient has taken from forty to sixty doses; in the treatment of the drug habit.—*T.G.* '02, 41, 71.

Morphine-Scopolamine Anæsthesia.—Hypodermic injection of $\frac{1}{200}$ to $\frac{1}{150}$ or even $\frac{1}{64}$ grain of Scopolamine Hydrobromate with $\frac{1}{7}$ grain of Morphine, to be repeated after one or two hours, previous to an operation. Very little Chloroform is required, and the patients sleep for hours after the operation, and do not complain of any pain.—*B.M.J.E.* '01, ii. 44.

Morphine-Scopolamine anæsthesia would be found useful in those cases where Chloroform and Ether are both contra-indicated, but that its action is not narcotic enough to admit of its taking the place of the general inhalation anæsthetics.—*B.M.J.E.* '03, i. 14.

G. Volkmann found it advisable to give 12 milligrammes (about $\frac{1}{5}$ grain) of Scopolamine and 1·5 centigramme (about $\frac{1}{4}$ grain) of Morphine four hours before the operation and repeat the doses two hours later, and $\frac{1}{4}$ hour before the operation he gives 3 mg. (about $\frac{1}{20}$ grain) of Scopolamine and 5 mg. (about $\frac{1}{12}$ grain) of Morphine. In the case of old people, or patients suffering from diseases of the internal organs, he employed smaller doses. In some cases the anæsthesia had to be deepened by Ether inhalation (given drop by drop).—*B.M.J.E.* '04, 1. 21.

Administered hypodermically in repeated doses of $\frac{1}{64}$ grain accompanied by $\frac{1}{6}$ grain Morphine Sulphate, four hours, two hours, and one hour before the time fixed for operation, it produces (*M.P.* '05, ii. 575) a quite restful sleep, giving two or three hours good anæsthesia. It does not, however, give complete muscular relaxation, and therefore ought not to be given in operations where complete relaxation is required, *e.g.*, abdominal operations.

As a general anæsthetic, solution of 1 milligramme ($\frac{1}{4}$ grain) with a centigramme ($\frac{1}{6}$ grain) of Morphine in 1 c.c. of Distilled Water injected subcutaneously four hours before the surgical operation, followed by a second injection after an interval of one hour (*B.M.J.E.* '05, i. 48).

Scopolamine-morphine is recommended (*Glasgow Med. Jour.* '06, 298) as a preparative to Chloroform, and not as a means of inducing full narcosis;

this is supported by Korff, Kümmel, Krönig, and others. For this purpose, small doses, ½ milligramme ($\frac{1}{120}$ grain) of Scopolamine with ½ to 1½ centigrammes ($\frac{1}{12}$ to ¼ grain) of Morphine, should be given half to one hour before the operation; or better still, if time allows, half this dose should be given an hour and a half before operation, and repeated in an hour. Chloroform must be given in very small quantities, drop by drop, and should not be pushed to the point of abolishing the reflexes. This persistence of the reflexes, indeed, is one of the disadvantages, and the limbs should be mechanically controlled. Ether is still less satisfactory in this respect. In old people, however, even the small dose of Scopolamine is sometimes sufficient to induce anæsthesia without the addition of Chloroform. At the end of the operation, the patient should be given an infusion or enema of 1 to 2 pints of warm Saline Solution, in order to obviate the thirst which in these cases is sometimes distressing; and when he awakes some hours after he may be given a little food. Special care must be taken with children and patients suffering from diseases of the heart or kidneys. *See* also *B.M.J.* '05, ii. 185, and *B.M.J.E.* '07, i. 47.

Two cases in which the subcutaneous injection of 1 mg., along with 1 cg. of Morphine, one hour before the administration of chloroform was followed by death on the operation table.—*B.M.J.E.* '07, ii. 68.

Dose.—$\frac{1}{200}$ to $\frac{1}{100}$ grain = 0·0003 to 0·0006 gramme.

Ph. Ger. maximum single dose, 0·001 gramme; maximum daily dose, 0·003 gramme.

Prescribing Notes. *Best given by hypodermic injection. When given by the mouth it may be conveniently dissolved in Chloroform Water.*

Not Official.—Guttæ Hyoscinæ, Guttæ Hyoscinæ et Cocainæ, Hyoscine Discs, Injectio Hyoscinæ Hypodermica, Hyoscinæ Hydrochloridum (Scopolamine Hydrochloride), and Hyoscinæ Hydriodidum (Scopolamine Hydriodide).

Antidotes.—Pilocarpine Nitrate, half a grain hypodermically, or ⅓ grain Morphine; then stomach-tube or emetics, followed by stimulants and artificial respiration.

Foreign Pharmacopœias.—Official in Dan., Dutch, Ger., Jap., Swiss and U.S. (Scopolaminum Hydrobromidum); Ital. (Bromhidrato di Scopolamina). Not in the others. The title 'Hyoscine Hydrobromide,' introduced into *Ph. Ger.* iii., has been replaced in *Ph. Ger.* iv. by 'Scopolamine Hydrobromide.'

Tests.—Hyoscine Hydrobromide contains theoretically 12·33 p.c. of Water. It is officially required to lose rather more than 12·0 p.c. of its weight at a temperature of 100° C. (212° F.); the *P.G.* gives 12·3 p.c.; the *U.S.P.* states that it loses its Water of crystallisation at 110° C. (230° F.). The anhydrous salt melts, according to Hesse, at 181° C. (357·8° F.), and not as officially stated at 193° to 194° C. (379·4° to 381·2° F.). Jowett confirms Hesse's melting point, and states that the purified lævo salt melts at 193° C. (279·4° F.), and the inactive modification at 180° C. (356° F.). The tests and characters of the official salt should therefore be given for the pure product as it appears in commerce, which is a mixture of stereoisomers melting at 181° C. (357·8° F.). The *U.S.P.* gives the melting point as 191° to 192° C. (375·8° to 377·6° F.); the *P.G.* at about 180° C. (356° F.). Its aqueous solution is stated in all three Pharmacopœias to be slightly acid in reaction towards Litmus, though Jowett states (*P.J.* '98, ii. 196) that there is no reason why the salt should not be neutral to Litmus. Its aqueous solution slightly acidified with Hydrochloric Acid yields with Potassiomercuric Iodide (Mayer's) Solution, a yellowish-white precipitate.

Its aqueous solution yields with Mercuric Chloride T.S. a white precipitate, with Phospho-tungstic Acid Solution a white precipitate; when in sufficiently concentrated solution it yields with Picric Acid a yellow precipitate; with Iodine Solution a brown precipitate; and with Platinum Chloride Solution a yellow precipitate. The aqueous solution yields a whitish precipitate with Potassium Hydroxide Solution. The turbidity is only produced on the addition of a considerable excess of Sodium Hydroxide Solution and disappears quickly. The aqueous solution is not precipitated by Ammonia Solution, or by Potassium Bichromate Solution. It is officially stated to form a crystalline salt with Auric Chloride having a m.p. of 198° C. (388·4° F.); Jowett (*J.C.S. Trans.*, '97, 679) has shown that under the *B.P.* conditions an additive compound Hyoscine Hydrobromide Gold Chloride melting at 215° C. (419° F.) is formed, but that when prepared in the usual manner the Aurichloride melts sharply at 198° C. (388·4° F.). The *U.S.P.* gives the m.p. of the pure Chloraurate at 197° C. (386·6° F.). When Hyoscine Hydrobromide is dissolved in Water it yields with Silver Nitrate Solution a yellowish curdy precipitate, insoluble in Nitric Acid, and when washed, practically insoluble in Ammonia Solution. One or two drops of Chlorine Water added to a small quantity of a 1 in 10 aqueous solution yield a reddish-brown solution, and when shaken with Chloroform the brownish-red colour passes into the chloroformic layer. A small crystal of the salt evaporated to dryness in a white porcelain dish on a water-bath, leaves a yellowish residue, which upon the addition of an Alcoholic Potassium Hydroxide Solution yields a violet coloration. Its freedom from readily charred organic impurities may be ascertained by the Sulphuric Acid test, the salt should yield but a pale yellow coloration when treated with this Acid, and if after the addition of Nitric Acid no colour is developed the absence of Morphine may be inferred. The salt should leave no weighable residue when ignited with free access of air.

Commercial samples may contain in addition to inactive Scopolamine (Atrosine) Apoatropine. Apoatropine is, according to Kobert (*P.J.* '05, i. 442), a dangerous impurity and one to be rigidly excluded. Absolutely necessary for the official description to require a rotatory power not less than that shown by the pure salt −25·45° for a 6·5 p.c. solution at 15·8° C. (60·5° F.).

Sulphuric Acid.—Only a faint yellow colour should be developed on the addition of Sulphuric Acid to Hyoscine Hydrobromide.

Nitric Acid.—On the subsequent addition of a drop of Nitric Acid to the above mixture no coloration should be developed, *U.S.P.*

Not Official.

GUTTÆ HYOSCINÆ. *Syn.* Guttæ Scopolaminæ.—Hyoscine Hydrobromide, 2 grains; Distilled Water, 1 fl. oz.—*London Ophthalmic* and *Charing Cross.*

Hyoscine Hydrobromide 0·5 or 1 p.c.—*St. Thomas's* and *B.P.C.*

GUTTÆ HYOSCINÆ ET COCAINÆ.—Hyoscine Hydrobromide, 0·5 p.c.; Cocaine Hydrochloride, 1·0 p.c.—*St. Thomas's* and *B.P.C.*

INJECTIO HYOSCINÆ HYPODERMICA.—A convenient solution is made by dissolving Hyoscine Hydrobromide, 1 grain, in sterilised Distilled Water, 500 minims, but the strength should always be indicated by the prescriber.

Dose. 2 to 5 minims = 0·12 to 0·3 c.c. as a sedative in nervous diseases, especially where there is much violence and excitement. When given by the mouth at least double the dose is required to produce the same effect.—*L.* '89, ii. 736.

Hyoscine Discs.—$\frac{1}{200}$ and $\frac{1}{75}$ grain, *St. Bartholomew's*; $\frac{1}{200}$ grain, *Guy's*.

HYOSCINÆ HYDROCHLORIDUM (Hyoscine Hydrochloride, Scopolamine Hydrochloride).—Large, colourless, prismatic crystals, or as a colourless crystalline powder, readily soluble in Water, and in Alcohol (90 p.c.).

Dose.—$\frac{1}{200}$ to $\frac{1}{100}$ grain = 0·0003 to 0·0006 gramme.

Tests.—Hyoscine Hydrochloride answers to the tests distinctive of Hyoscine given under Hyoscina and Hyoscinæ Hydrobromidum. The aqueous solution yields with Silver Nitrate Solution a white curdy precipitate, which, when filtered and washed, is insoluble in Nitric Acid but readily dissolves in Ammonia Solution. The salt when ignited with free access of air leaves no weighable residue.

HYOSCINÆ HYDRIODIDUM (Hyoscine Hydriodide, Scopolamine Hydriodide).—Colourless, transparent prismatic crystals. Soluble in Water, and in Alcohol (90 p.c.).

Dose.—$\frac{1}{200}$ to $\frac{1}{100}$ grain = 0·0003 to 0·0006 gramme.

HYOSCYAMINÆ SULPHAS.

HYOSCYAMINE SULPHATE.

$(C_{17}H_{23}NO_3)_2,H_2SO_4,2H_2O$, eq. 707·20.

White, slender, crystalline, hygroscopic needles, or an odourless, white, granular, hygroscopic powder.

It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from contact with air, especially moist air.

Solubility.—2 in 1 of Water; 1 in 4½ of Alcohol (90 p.c.); very slightly soluble in Chloroform or Ether.

Medicinal Properties.—In small doses it is a sedative for mental excitement and insomnia, and in large doses it has been used for calming the excitement of delirium tremens and acute mania, but for this purpose it is superseded by the salts of Hyoscine.

Taken for sea-sickness in $\frac{1}{100}$ grain doses three or four times a day, two or three days before embarking, and for the first days on board ship, until nausea has disappeared.—*B.M.J.* '93, ii. 596.

These are conveniently carried as half-grain pilules, made with 'Diluting Mixture,' p. 897.

Dose.—$\frac{1}{200}$ to $\frac{1}{100}$ grain = 0·0003 to 0·0006 gramme.

Hager, maximum single dose, 0·005 gramme; maximum daily dose, 0·015 gramme.

Not Official.—Hyoscyaminæ Hydrobromidum, Hyoscyamine Discs.

Foreign Pharmacopœias.—Official in U.S. Not the others.

Tests.—Pure Hyoscyamine Sulphate melts at 204° C. (399·2° F.); the commercial Hyoscyamine Sulphate melts at about 200° C. (392° F.); the official melting point is 206° C. (402·8° F.). The *U.S.P.* m.p. is 198·9° C. (390·1° F.). Jowett suggests (*P.J.* '98, ii. 196) that an official m.p. should be given not lower than 200° C. (392° F.). Its aqueous solution is neutral in reaction towards Litmus paper and is lævogyrate. It affords a yellow precipitate with Auric Chloride. Both the *B.P.* and *U.S.P.* state that the yellow precipitate is soluble in boiling Water acidified with Hydrochloric Acid, and again deposited in the form of brilliant golden yellow scales on cooling the solution. A small crystal evaporated to dryness in a porcelain dish on a water-bath, with 5 drops of Nitric Acid, leaves a yellowish residue which, when moistened with Alcoholic Potassium Hydroxide Solution, affords a purple-violet coloration. The m.p. of the Aurichloride is 160° C. (320° F.). The *U.S.P.* gives this figure for the m.p., but *B.P.* gives no figure. The *U.S.P.* also gives a figure for m.p. of the Picrate. The aqueous solution of the salt yields with Barium Chloride Solution, a white precipitate insoluble in Hydrochloric Acid.

The more generally occurring impurities are fixed residue, alkaloids other than Hyoscyamine, readily charred organic impurities.

The salt should leave no weighable residue when ignited with free access of air. Most alkaloids other than Hyoscyamine may be detected by the behaviour with Platinic Chloride Solution as described in the small type below; readily charred organic impurities are revealed by the Sulphuric Acid test. Hyoscyamine may be distinguished from Atropine by its optical activity and by the m.p. of its Aurichloride. Compare Atropine, p. 199.

Picric Acid.—Hyoscyamine Picrate melts at 162° C. (323·6° F.). Atropine Picrate melts at 175° C. (347° F.), *U.S.P.*

Platinic Chloride.—No precipitate is formed in solutions of the salt on the addition of T.S. of Platinic Chloride, *U.S.P.*; a solution in Water acidulated with Hydrochloric Acid yields no precipitate with Platinic Chloride Solution, *B.P.*

Sulphuric Acid.—No colour should be produced when Sulphuric Acid is added to Hyoscyamine Sulphate, *U.S.P.*

Not Official.

HYOSCYAMINÆ HYDROBROMIDUM.—Short white or yellowish-white prismatic crystals, readily soluble in Water, and in Alcohol (90 p.c.).

On account of its deliquescent nature it should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from exposure to air.

Dose.—$\frac{1}{200}$ to $\frac{1}{100}$ grain = 0·0003 to 0·0006 gramme.

Official in U.S.

Tests.—Hyoscyamine Hydrobromide melts at 151·8° C. (305·3° F.) Its aqueous solution is neutral in reaction towards Litmus and is lævogyrate. It answers the tests distinctive of Hyoscyamine given under Hyoscyaminæ Sulphas, with the exception of the test with Gold Chloride Solution. The *U.S.P.* 1890 stated that with Gold Chloride Solution an aqueous solution of the salt yields a precipitate which when recrystallised from a small quantity of boiling Water acidulated with Hydrochloric Acid, is deposited on cooling in minute, lustrous golden yellow scales.

Jowett has shown (*J.C.S. Trans.*, '97, 679) that under the above conditions a Hyoscyamine Hydrobromide Gold Chloride is produced, it forms a yellowish-red salt which crystallises from boiling acidified Water in scales, melting sharply at 164° C. (327·2° F.), and suggested that the *U.S.P.* description required modification. The description of the test appearing in the 8th Decennial Revision of the *U.S.P.* is, however, the same as that given in the 1890 Edition. The aqueous solution yields with Silver Nitrate Solution a yellowish-white curdy precipitate which is insoluble in Nitric Acid; when filtered and washed it is practically insoluble in Ammonia Solution, but readily soluble in Potassium Cyanide. It is liable to contain the same impurities as the Sulphate, and the methods adopted for their detection in the latter may be also applied here. The *U.S.P.* includes a test for Morphine; no colour should be produced on the addition of Nitric Acid to a mixture of Hyoscyamine Hydrobromide and Sulphuric Acid.

Hyoscyamine Discs (for hypodermic injection).—$\frac{1}{80}$ and $\frac{1}{20}$ grain of Hyoscyamine Sulphate.—*St. Bartholomew's.*

Not Official.

ICHTHYOCOLLA.

ISINGLASS.

FR., COLLE DE POISSON; GER., HAUSENBLASE; ITAL., COLLE DI PESCE; SPAN., ICTIOCOLA.

The swimming bladder or sound of various species of *Acipenser*, prepared and cut into fine shreds.

This well-known substance was in the early London Pharmacopœias, and called Ichthyocolla or Fish Glue; it was used in medicine as a nutrient. It is still to be found in most of the Continental Pharmacopœias. It is used for fining Wine, for which purpose Gelatin does not answer. Russian Isinglass is reckoned the best quality. Isinglass is used for Court Plaster and Gold-beater's Skin.

Isinglass, 15 grains to the fl. oz. of Glycerin is useful in some skin diseases.

This is included among the Tests of the *B.P.*, its solution being used for Tannic Acid, with which it forms an insoluble compound.

Foreign Pharmacopœias.—Official in Austr., Belg., Fr., Hung., Jap., Norw. and Russ. (Colla Piscium); Ital. (Colla de Pesce); Mex. (Cola de Pescada); Port. (Gelatina de Peixe); Span. (Ictiocola). Not in the others.

Descriptive Notes.—There are many varieties of Isinglass in commerce differing in shape and quality. It consists of the swimming bladder of various fishes washed and freed more or less from the lining membranes. The kind preferred for use in medicine is derived from various species of Sturgeon (*Acipenser Huso*, etc.) and is imported from Russia. It is prepared in the form of leaf Isinglass, *i.e.*, the swimming bladder is cut open, cleaned and pressed flat, or twisted when soft into various shapes or folded and known as long and short staple or book Isinglass, but in retail commerce is offered cut up into slender threads, which can be distinguished from Gelatin by its laminated structure.

Tests.—Isinglass is not soluble in cold Water, but the best qualities dissolve almost entirely in boiling Water. On treating Russian Isinglass with hot Water the substance swells uniformly, producing a whitish opaline jelly which gradually dissolves entirely; Gelatin, under similar conditions, swells irregularly and gives a nearly transparent solution. The best Russian Isinglass usually leaves from 0·4 to 1·0 p.c. of ash.

Not Official.

ICHTHYOL.

AMMONIUM ICHTHYOLSULPHONATE.

A reddish-brown, syrupy liquid, with igneous bituminous odour and taste. Obtained by the action of Sulphuric Acid on a Sulphur-containing mineral oil distilled from peculiar fossil deposits, principally fish, and subsequent neutralisation with Ammonia.

Solubility.—Entirely soluble in Water, partly soluble in Alcohol (90 p.c.) and Ether, entirely in a mixture of both.

It mixes readily with Glycerin, Fats, Oils, Soft Paraffin, and Lanolin.

Medicinal Properties.—Used both internally and externally for chronic eczema, psoriasis, and also for chronic rheumatism; as an application in pruritus and prurigo. Useful in chilblains, 10 to 20 per cent in Lanolin.

The following formula is recommended for eczema: Litharge, 10; Diluted Acetic Acid, 30; boil down to 20, add Olive Oil, Lard, and Ichthyol of each 10, all by weight, to make an **Ointment.**—*L.* '83, i. 334. It is better to boil down to 13, as Water separates from the Ointment if evaporated only to 20 as directed.

For uterine affections it is used with Glycerin as a tampon.—*L.* '90, i. 1142; '91, i. 55.

As a **gargle** in acute pharyngitis.—*L.* '94, ii. 1113. As a **paint** (20 p.c. sol.) for foot blisters.—*T.G.* '95, 56. As 10 p.c. antiseptic injection in vesical catarrh, *M.A.* '95, 139; and in gonorrhœa, *T.G.* '93, 349; *Pr.* lii. 370. 1 to 2 p.c. aqueous solution used as irrigations in gonorrhœa.—*L.* '97, i. 1165; *T.G.* '96, 350.

Given to a limited extent and has been sometimes beneficial in some hyperæmic diseases like acne rosacea.—*L.* '03, i. 785.

As an ointment composed of Ichthyol, 1; Vaseline, 1; applied to the pustules and surrounding skin in smallpox.—*B.M.J.E.* '03, ii. 24.

In pruritus vulvæ, as a 15 p.c. ointment made with Lard.—*T.G.* '99, 319.

In 3-grain doses in urticaria.—*B.M.J.E.* '95, i. 16. Internally in phthisis.—*L.* '94, i. 1521; *B.M.J.E.* '95, i. 51; '95, ii. 28; *P.J.* '95, ii. 51; '96, ii. 484; *B.M.J.E.* '99, i. 60.

Applied so as to cover the healthy skin beyond the affected part modifies, and distinctly shortens the duration of, erysipelas; 30 to 60 p.c. Ointment, or 10 p.c. **Collodion** for sensitive skins.—*T.G.* '91, 862; '92, 294, 684; *M.A.* '95, 249; *B.M.J.E.* '94, i. 24, 43; as a 5 to 10 grain suppository in prostatitis.—*B.M.J.E.* '93, ii. 24.

It is not without danger, as an application of 1 Ichthyol and 5 Vaseline to a child four years old produced stupor for twelve hours, but it completely recovered.—*B.M.J.* '84, ii. 1013.

Zinc Oxide, 20; Magnes. Carb., 10; Ichthyol, 1 to 2; useful for burns of the first degree. Calcii Carb., 10; Zinci Oleatis, 10; Aq. Calcis, 10; Ichthyol, 1 to 3; for extensive burns.—*B.M.J.E.* '95, ii. 92.

Dose.—15 to 30 grains = 1 to 2 grammes.

Prescribing Notes.—*In* **pill** *made with a mixture of Althæa* 3, *Liquorice Powder* 3, *and Compound Tragacanth Powder* 2; 4 *of this powder to* 2 *of Ammonium Ichthyol or to* 4 *of Sodium Ichthyol. Also given in* **capsules**, *and Compressed Tablets.*

The Oils of Citronella, Eucalyptus, and Pinus Sylvestris have been suggested for disguising the odour of Ichthyol in external applications. For internal use, Milk, Chocolate, or Oil of Peppermint have been used. Essence of Almonds is also very good.

When Ichthyol is ordered, the Ammonium salt is generally understood; the Sodium salt has similar properties, is more of a solid, and makes a smaller pill.

Diluted with Vaseline or Lanolin to form a 10 *to* 50 *p.c.* **Ointment**; *also used as a* 10 *to* 20 *p.c.* **Collodion.**

Lithium, Magnesium *and* **Zinc Ichthyolsulphonates** *have been employed medicinally. The Magnesium salt makes a suitable pill-mass, and may be prepared by making* 120 *grains of the Ammonium salt and* 15 *grains of light Calcined Magnesia into a paste with Water, and evaporating to dryness on a water-bath. This brown powder,* 2 *parts of which are equal to* 3 *of the Ammonium salt, will make nice pills with a drop or two of Water.*

When dispensed with Potassium Bromide, a turbid brown precipitate settling to a sticky mass is thrown out, and adheres to the bottle; the addition of Mucilage of Acacia does not prevent this.

For **pessaries** *a Gelatin basis with Ichthyol after a time becomes hard and insoluble. They keep best when made with Cocoa-butter alone.* 3 *grains of Ichthyol with* 12 *grains of Oil of Theobroma make a good suppository.*

Incompatibles.—Alcohol, Alkali Hydroxides and Carbonates, mineral acids and Potassium Bromide. Alkaloids are incompatible with Ammonium Ichthyolsulphonate, and decompose it with formation of an Ichthyolsulphonate of the alkaloid, and liberation of Ammonia. With alkaloidal salts a double decomposition takes place.

Foreign Pharmacopœias.—Belg., Ital. (Ittiolo), Jap., Ammonium Sulphoichthyolate, Russ. and Span. (Ictiol).

Tests.—Ammonium Ichthyolsulphonate, when warmed with Potassium or Sodium Hydroxide Solution, evolves Ammonia gas, readily recognised by its odour and by its action upon moistened red Litmus paper; if the mixture be evaporated to dryness and ignited a carbonaceous mass is left, which evolves an odour of Hydrogen Sulphide when acidified with Hydrochloric Acid. When evaporated on a water-bath it usually loses about 45 p.c. of its weight, and should lose at the most not more than 50 p.c. The clear aqueous solution is slightly alkaline in reaction towards red Litmus paper. A 10 p.c. aqueous solution, when mixed with Hydrochloric Acid, throws down a dark resinous precipitate, which is soluble in Ether and in Water, but is reprecipitated from the latter liquid by Hydrochloric Acid or Sodium Chloride. When evaporated and ignited with free access of air it should leave no weighable residue.

GELATUM ICHTHYOL.—Gelatin, 1; Distilled Water, 2½; Ichthyol, 1; Glycerin, 6; all by weight.—*Pharm. Form.*

This has been incorporated in the *B.P.C.* under the title **Pasta Ichthamolis.**

INJECTIO ICHTHYOL.—2 to 5 p.c.—*Lock.*

PASTA ICHTHYOL (Unna).—Ammonium Ichthyolate, 2 scruples to 2 drm.; Powdered Dextrin, 1 oz.; Distilled Water, 1 oz.; Glycerin, 6 drm. Dissolve the Ichthyol in the Water and Glycerin, mix with the Dextrin and heat on a water-bath until uniform.—*Pharm. Form.*

Ammonium Ichthyol, 25; Carbolic Acid, 2½. Dissolve in warm Water 22½ and Starch 50.—*B.M.J.E.* '91, i. 102.

This has been incorporated in the *B.P.C.* under the title **Pasta Ichthamolis Composita.**

Dr. Unna considers that for certain purposes a waterless **Ichthyol varnish** possesses advantages over the usual preparations, and gives the following formula: Ichthyol, 40; Starch, 40; Solution of Albumen, 1 to 1½, Water, to 100. The Starch is first moistened with the Water, then the Ichthyol well rubbed up with it, and lastly the solution of Albumen is added.—*L.* '91, i. 622; *B.M.J.E.* '91, i. 102.

UNGUENTUM ICHTHYOL.—Ichthyol, 1; Paraffin Ointment, 9; Mix.—*King's.*

Recommended in the treatment of chilblains.—*B.M.J.* '91, i. 503.

Unguentum Ichthamolis.—Ammonium Ichthyosulphonate, 10; Hydrous Wool Fat, 90; Mix.—*B.P.C.*

UNGUENTUM ICHTHYOLIS.—Ichthyol, 40 grains; Salicylic Acid, 8 grains; Soft Paraffin, to 1 oz.—*London.*

UNGUENTUM ICHTHYOLIS COMPOSITUM.—Ichthyol, 1; Solution of Lime, 9; Hydrous Wool Fat, 5; Soft Paraffin (yellow), 10; Zinc Ointment, 5.—*Guy's.*

VASOLIMENTUM ICHTHYOLI.—Ammonium Ichthyol, 10; Liquid Vasoliment, 90.—*Hager.*

Parogen Ichthamolis. *Syn.* Ichthamol Vasoliment.—Ammonium Ichthyosulphonate, 10; Parogen, *q.s.* to produce 100.—*B.P.C.*

NATRIUM SULPHO-ICHTHYOLICUM (Sodium Ichthyolsulphonate).—A brownish-black tar-like mass, with a bituminous odour.

Solubility.—It makes a somewhat turbid solution with Water; dissolves in a mixture of equal weights of Alcohol and Ether. It is soluble in Benzol.

Medicinal Properties.—The same as the Ammonium salt.

Tests.—Sodium Ichthyol dissolves in Water, forming a solution which is only faintly alkaline in reaction towards red Litmus paper. When ignited it leaves a residue possessing an alkaline reaction, which colours a non-luminous flame intensely yellow, and which, when dissolved in Water and acidified with diluted Nitric Acid yields, with Barium Chloride Solution, a white precipitate insoluble in Hydrochloric Acid. The aqueous solution, when acidified with Hydrochloric Acid, precipitates a dark resinous mass which, when separated from the supernatant liquid, is soluble in Ether and in Water, but is again precipitated from the latter fluid by the addition of Hydrochloric Acid or Sodium Chloride. It contains from 25 to 30 p.c. of moisture, which may be determined by drying over Sulphuric Acid, preferably in a vacuum desiccator. It should not evolve Ammonia when heated with Potassium or Sodium Hydroxide Solution, indicating the absence of Ammonium Ichthyolsulphonate.

ICHTHOFORM (Formaldehyde Ichthyosulphonate).—A blackish-brown powder, possessing a bituminous odour, insoluble in Water, and in Alcohol (90 p.c.). Introduced as an intestinal antiseptic.

Dose.—10 to 20 grains = 0·65 to 1·3 gramme.

FERRICHTHOL (Iron Ichthyolsulphonate).—A dark, blackish-brown, non-hygroscopic, amorphous powder. Has been given in anæmia.

ANYTIN.—Under this title a 33 p.c. aqueous solution of Ichthyolsulphonic Acid has been introduced into medicine. It possesses the property of rendering soluble in Water substances which are otherwise insoluble, or nearly so. The compounds so produced are known as **Anytols**, and **Meta-Cresol, Guaiacol, Camphor** and **Iodine-Anytols** have received some attention as medicinal agents, chiefly as antiseptics.

THIOL.—An artificial substitute for Ichthyol, prepared by the action of Sulphur on gas oil, and subsequent treatment with Sulphuric Acid. It is supplied in two forms, a **powder** and a **liquid**; it is soluble in Water and almost odourless.

Useful in acute forms of erythema, in erysipelas, and in inflammatory diseases of women, also in pruritus of the female genitals.—*Pr.* lvi. 565.

A 20 to 40 p.c. solution is used for erysipelas in same manner as Ichthyol.—*B.M.J.E.* '94, i. 103; *T.G.* '94, 627.

ICHTHALBIN (Albumen Ichthyolsulphonate).—A greyish-brown powder, almost odourless and tasteless. Insoluble in Water, decomposed by alkalis.

Dose.—7½ to 30 grains = 0·5 to 2 grammes per diem.

Tumenol.—A similar body to Ichthyol, is a thick dark brown liquid. It is a mixture of Tumenolsulphone (**Tumenol Oil**) and Tumenolsulphonic Acid (**Tumenol Powder**).

Tumenol Ammonium is a compound introduced to overcome the difficulty with which ordinary Tumenol is miscible with various diluents. It contains more Water than Tumenol. It is practically neutral, fairly soluble in Water, is miscible with slight turbidity to the extent of 1 to 5 in mixtures of equal parts of Alcohol, Water and Ether, and in Alcohol, Glycerin and Ether. The formulas for various lotions and ointments are also given.—*P.J.* '05, ii. 399.

Petrosulfol.—A dark brown thick syrupy substance. Soluble in Water. Similar in its therapeutic properties to Ichthyol.

Not Official.

IGNATIA AMARA.

The Seed of *Strychnos Ignatii*, Berg.

Medicinal Properties.—Similar in action to Nux Vomica.

Foreign Pharmacopœias.—Official in Fr. (Fève de St. Ignace); Mex. (Cabalonga); Port. (Fava de S. Ignacio); Span. (Haba de S. Ignacio).

EXTRACTUM IGNATIÆ AMARÆ.—Prepared by percolating Ignatia Beans with Alcohol (90 p.c.), and evaporation.

Tonic, given in debility of the digestive organs.

Dose.—⅛ to 1 grain = 0·008 to 0·065 gramme in a pill three times a day.

Official in Mex.

TINCTURA IGNATIÆ AMARÆ.—1 of Ignatia Beans, percolated with Alcohol (70 p.c.) to yield 10.

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

Foreign Pharmacopœias.—Official in Mex. (Tintura de Cabalongas), 1 in 5.

TEINTURE DE FÈVE DE SAINT-IGNACE COMPOSÉE (Fr.).—St. Ignatius Beans (rasped), 100; Potassium Carbonate, 2·5; Prepared Soot, 0·5; Alcohol (70 p.c.), 500; macerate for 10 days, and filter.

INFUSA.

INFUSIONS.

Fr., Apozèmes, Tisanes; Ger., Aufgüsse; Ital., Infusi; Span., Infusiones.

Infusions, though generally made with boiling Water, are in some cases ordered to be made at a lower temperature, as Infusum Calumbæ, the starch of which would be dissolved by boiling Water. The mucilage and vegetable albumen present are, however, dissolved by cold Water, and these render the Infusion liable to change.

When the Infusion is to be made with boiling Water the pot or vessel should be first rinsed with boiling Water. The ingredients should be suspended immediately under the surface of the Water, or otherwise should be stirred from time to time during infusion.

There is a very large demand for so-called Concentrated Infusions; but although very convenient and comparatively economical they have not the same characters as the freshly-made Infusions. *B.P.* '98 has included some Liquores Concentrati which are intended to represent Concentrated Infusions; they are fluid extracts, prepared with weak spirit (Alcohol 20 p.c.).

There are no General Directions given in the British Pharmacopœia for the preparation of Infusions.

General Directions given in German Pharmacopœia.—For the preparation of Infusions boiling Water is poured on the medicament, which must be finely cut if necessary; heat for five minutes, with frequent shaking, on a water-bath, and strain after cooling. Infusions for which the amount of the respective substances is not specified, are prepared so that 10 parts of strained product are obtained from 1 part of substance. In the case of powerful substances for which a limit of dose is given, the quantity of substance is to be specified by the physician.

Directions in United States Pharmacopœia.—An ordinary Infusion, the strength of which is not directed by the physician nor specified by the Pharmacopœia, shall be prepared as follows: Put 10 of the substance into a suitable vessel, provided with a cover, pour upon it 200 of boiling Water, cover the vessel lightly, and let it stand half an hour in a warm place; then strain and pass enough Water through the strainer to make the Infusion measure 200 parts. The strength of Infusions of energetic or powerful substances should be specially prescribed by the physician.

Two general methods are recommended by *E. H. Farr* and *R. Wright* for the preparation of **Concentrated Infusions.** They employ dilute Chloroform Water (1 in 1000) and Alcohol as a preservative, and the finished product when diluted in the proportion of 1 part to 7 parts of Water is fairly approximate to the corresponding fresh Infusion. In the first process, **Repercolation**, half the drug is moistened with the menstruum and percolated, the remainder is then moistened and percolated with the first percolate until completely exhausted. The weak portions are evaporated and added to the stronger and made up to volume. By the second method, that of **Macero-Expression,** the quantity of drug ordered per 20 fl. oz. is macerated in 15 oz. of the menstruum in a covered earthenware vessel for 24 hours, pressing slightly when the drug is not completely covered with the menstruum, strain and press the marc; to the resulting liquid add any other ingredients specified, and reserve; repeat the maceration a second and third time for 6 hours each, and evaporate the resulting mixed liquors, add them to the reserved portion and make up to 20 fl. oz., set aside for 7 days and filter. When diluted Alcohol is used the third maceration may be omitted, and only enough menstruum used in the second to make the expressed united liquids measure 20 fl. oz.—*P.J.* '06, 163, 166, 169, 226; *C.D.* '06, i. 252, 253; *P.J.* '07, 1, 621; *Y.B.P.* '07, 247.

Not Official.

INULA.

ELECAMPANE.

The Root of *Inula Helenium*, L. It contains large quantities of Inulin, a body allied to Starch; also a crystalline bitter substance, Helenin or Alantcamphor.

Foreign Pharmacopœias.—Official in Mex. and Port. Not in the others.

HELENIN (C_6H_8O).—Colourless, acicular crystals, almost insoluble in Water, but readily soluble in hot Absolute Alcohol, Ether, and Volatile Oils. Has been found to possess powerful antiseptic properties, and has been given in broncho-pneumonia, tuberculosis, and diphtheria.

Dose.—¼ to 2 grains = 0·016 to 0·13 gramme.

Official in Mex.

IODOFORMUM.

IODOFORM. TRI-IODOMETHANE.

CHI_3, eq. 390·61.

FR., IODOFORME; GER., IODOFORM; ITAL., IODOFORMIO; SPAN., YODOFORMO.

The shining, lemon-yellow, small hexagonal crystals are official; but for dispensing purposes it is supplied as a fine crystalline **Powder.** There is also a **Precipitated Iodoform**, which, however, has a tendency to agglomerate. Iodoform has an unpleasant characteristic odour and taste, and is somewhat unctuous to the touch.

It should be kept in well-stoppered glass bottles of a dark amber tint in a cool atmosphere and should be protected as far as possible from the light.

It is chemically a Tri-iodomethane and may be prepared by the action of Iodine and an alkali or alkali Carbonate upon Ethylic Alcohol.

Solubility.—Very sparingly soluble in Water; 1 in 7 of Ether; 1 in 14 of Chloroform; 1 in 120 of Alcohol (90 p.c.). It is also soluble in the fixed and volatile Oils, and about 1 in 100 of Glycerin;

1 in 30 of Olive Oil; 1 in 3⅓ of Carbon Bisulphide; sparingly in Petroleum Spirit.

Precipitated Iodoform frequently gives a turbid solution in Chloroform and Carbon Bisulphide, owing to the dampness of the powder, the adhering Water being insoluble in those fluids. It rapidly dries on free exposure to air, and will then form a clear solution.

The above figures for solubility have been incorporated in the *B.P.C.* The note respecting the solubility of Precipitated Iodoform in Chloroform and Carbon Bisulphide appeared in the 15th edition of the *Companion* and is aptly paraphrased in the *B.P.C.* as follows:—In the form of powder it sometimes contains a trace of moisture, consequently the solutions in Chloroform and Carbon Bisulphide may be turbid; a short exposure to the air, however, will quickly free it from the adherent moisture, when bright solutions may be obtained.

Medicinal Properties.—Antiseptic, deodorant and local anæsthetic. Useful in cleansing foul ulcers, buboes, soft chancres, or syphilitic sores, the **powder** being applied, or an **ointment** (1 drm. to 1 oz.), or a solution in Oil of Eucalyptus. Used as a deodorant, and to relieve the pain of cancer and abate the progress of the disease; as a soothing application to burns; also to relieve neuralgia, goitre, and glandular enlargements; as a **suppository** in chronic prostatitis, in hæmorrhoids and anal fissure.

A solution of Iodoform in Ether, containing about 40 p.c. of Liquid Paraffin in the proportion of ½ grain to 10 minims is used (*B.M.J.* '05, i. 67) as an intravenous injection in pulmonary tuberculosis. The Iodoform is placed in the syringe, the Ether drawn in and shaken till the powder is dissolved. A few minims of Liquid Paraffin may be drawn up and the whole well shaken.

Intravenous injections arrest pulmonary tuberculosis.—*L.* '05, i. 1341.

A mixture of:—Iodoform, 60; Spermaceti and Sesame Oil, of each, 40; has been used as a filling for chronic bone cavities.—*B.M.J.E.* '05, i. 70.

An Ointment of:—Iodoform, 5 to 10 grains; Vaseline, 2½ drm.; or Hydrarg. Ox. Flav., 1 to 5 grains; Vaseline, 2½ drm.: applied in keratitis.—*M.P.* '05, ii. 303.

A case of presumably tuberculous meningitis successfully treated (*L.* '05, ii. 964) with an ointment containing 15 grains in an oz. of Vaseline thoroughly rubbed into the scalp and the back of the neck every 8 hours.

As an antiseptic, Iodoform in fine powder, alone or mixed with Boracic Acid or Bismuth, is used as an **insufflation** for ulcerated throat or for ozœna, and as a packing in bone cavities.—*L.* '93, ii. 131.

Whitehead's Varnish is Compound Tincture of Benzoin, in which Ether (sp. gr. 0·735) has been substituted for Alcohol (90 p.c.), and contains 10 p.c. of Iodoform.

To prevent pitting in smallpox (*L.* '86, ii. 889); injections of Iodoform in goitre (*Pr.* lvi. 334); in tuberculous disease of the knee joint.—*B.M.J.* '97, ii. 397.

A stopping for bone cavities; Iodoform, 30 to 60; Spermaceti, 40; Sesame Oil, 20.—*B.M.J.* '01, ii. 46.

Daily hypodermic injections of 0·05 gramme of a mixture consisting of Iodoform, 1·5; Eucalyptol, 10; Liquid Vaseline, 0·5; in recurrent hæmoptysis in the early stage of tuberculosis.—*Pr.* lxii. 705.

Dose.—½ to 3 grains = 0·032 to 0·19 gramme.

Ph. Ger. maximum single dose, 0·2 gramme; maximum daily dose, 0·6 gramme.

Prescribing Notes.—*The Iodoform should be finely powdered, or still better, precipitated Iodoform should be used, and suspended with Mucilage of Acacia for a* **mixture** *or* **lotion**; *or it may be given in* **pills** *made with Glucose or one-sixth of its weight of Compound Powder of Tragacanth and Dispensing Syrup, or Diluted Glucose, q.s. to mass.*

To cover the smell of Iodoform, Oil of Geranium (5 *minims to* 2 *drm.*) *answers* *very well, as does also Menthol, 2 to 98. Both of these are good, and next after them comes Coumarin, 2 to 98.*

The odour of Iodoform can be removed from the hands by rubbing them with Oil of Turpentine; rubbing with Orange-flower Water is also useful.

Incompatible.—Iodoform is incompatible with Calomel.

Official Preparations.—Suppositoria Iodoformi and Unguentum Iodoformi.

Not Official.—Iodoform Antiseptic Gauze, Iodoformum Aromatisatum, Iodoform Lint, Iodoform Ointment, Iodoform Varnish, Liquid Iodoform, Bougies of Iodoform and Eucalyptus, Collodium Iodoformi, Emulsio Iodoformi, Glycerinum Iodoformi, Gossypium Iodoformi, Injectio Iodoformi, Insufflatio Iodoformi, Insufflatio Iodoformi et Morphinæ Composita, Nebula Iodoformi, Parogenum Iodoformi, Pastillus Iodoformi, Pulvis Iodoformi Compositus, Pigmentum Iodoformi, Unguentum Iodo Paraffini, Unguentum Iodoformi et Eucalypti, Unguentum Iodoformi cum Atropina, Vasolimentum Iodoformi, Whitehead's Varnish, Eka-Iodoform, Iodoformin, Iodoformogen, Di-iodoform, Iodol, Iodolene, Europhen, *see* p. 43, Loretin, *see* p. 990, Iodo-Salicylic Acid, *see* p. 79.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch., Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S. Iodoform Solution in Ether 1 in 20 by weight is official in Belg.

Tests.—Iodoform melts at about 115° C. (239° F.) to a brown liquid, which evolves at a higher temperature brown and violet vapours of Iodine, and leaves a black carbonaceous residue. The *U.S.P.* gives the m.p. as about 115° C. (239° F.); *P.G.* as about 120° C. (248° F.). It is slowly volatile at the ordinary temperature of the air, and distils slowly with the vapour of Water. When warmed with an Alcoholic Potassium Hydroxide Solution it is decomposed into Potassium Formate and Potassium Iodide. If the Alcoholic Potassium Hydroxide Solution be evaporated to dryness and the residue be dissolved in Water, the solution yields, on the addition of an excess of Nitric Acid, a brown coloration, and if the mixture be shaken with a little Carbon Bisulphide Solution the latter assumes an intense violet colour. The *B.P.* omits the evaporation to dryness, acidifying the alcoholic solution with Nitric Acid and testing the liquid for Iodine with Starch Mucilage. Its solutions in neutral solvents are neutral to Litmus.

The more generally occurring impurities are fixed impurities, soluble yellow colouring matters, *e.g.*, Picric Acid, etc.; free acid, soluble Iodides, and excess of moisture. Iodoform should leave no fixed residue when ignited with free access of air, and when treated with Water and filtered the filtrate should be free from colour, should possess no bitter taste, and should yield only a faint opalescence with Silver Nitrate Solution. The *U.S.P.* states that upon full combustion it should leave not more than 0·2 p.c. of residue; the *P.G.* that 0·1 of a gramme of Iodoform shall leave no weighable residue upon ignition. The neutrality of the sample towards Litmus ensures the absence of free acid. The *B.P.* states that it shall not yield any reaction with the tests for Iodides. The *U.S.P.* states that when dried over Sulphuric Acid the loss of weight should not exceed 1 p.c. Neither the *B.P.* nor the *P.G.* adopts a limit of moisture.

Water.—If Iodoform be shaken with Water (1–10 *P.G.*; 1–5 *U.S.P.*) and the mixture filtered the filtrate should be colourless, *P.G.*, and free from bitter taste, *B.P.* and *U.S.P.*

Silver Nitrate.—The filtrate obtained after agitation with Water, as above, should not be rendered more than faintly opalescent by T.S. of Silver Nitrate, *P.G.* and *U.S.P.*

Barium Nitrate.—Another portion of a filtrate obtained as above should be unaffected by T.S. of Barium Nitrate, *P.G.*

Preparations.

SUPPOSITORIA IODOFORMI.—Iodoform Suppositories.
3 grains of Iodoform in each, with Oil of Theobroma.

UNGUENTUM IODOFORMI.—Iodoform Ointment.
Iodoform, in fine powder, 1 ; Yellow Paraffin Ointment, 9.
(1 in 10)

Foreign Pharmacopœias.—Official in Dutch, Fr. and U.S., 1 in 10; Mex., Pomada de Yodoformo ; Iodoform 1, Ether 1, Vaseline 9. Not in the others.

Not Official.

IODOFORMUM AROMATISATUM.—Iodoform, 96 ; Coumarin, 4 ; Mix intimately.—*U.S.N.F.*

Note.—Should Coumarin not be available, or should it be objectionable to the patient, the odour of Iodoform may also be more or less masked by many essential oils ; for instance, those of Peppermint, Cloves, Cinnamon, Citronella, Bergamot, Sassafras, Eucalyptus, etc. Another efficient covering agent is freshly roasted and powdered Coffee.

The odour of Iodoform may be removed from the hands, or any utensils with which it has come in contact, by washing them with an aqueous solution of Tannic Acid.

See also *Prescribing Notes.*

IODOFORM OINTMENT (Deodorised).—Lanolin, 20 ; Iodoform, 2·2 ; Roasted Coffee (powdered), 1·25 ; Lard, 2·5.—*C.D.* '07, ii. 382.

IODOFORM ANTISEPTIC GAUZE.—Containing 10 and 20 p.c., *Fr.* (Gaze Iodoformée), and *Ital.*, 10 p.c., *Jap.* 5·5 p.c., and *Mex.* 11 p.c.

Iodoform Gauze wrung out of Adrenalin Solution has been used (*B.M.J.*, '04, ii. 1054) as a packing for the apex of the vagina in treatment of accidental hæmorrhage.

WHITEHEAD'S VARNISH.—Compound Tincture of Benzoin, in which Ether (sp. gr. 0·735) has been substituted for Alcohol (90 p.c.), and contains 10 p.c. of Iodoform.

This has been incorporated in the *B.P.C.* under the title **Pigmentum Iodoformi Compositum.** *Syn.* Whitehead's Varnish, as follows : Benzoin, 10 ; Prepared Storax, 7·50 ; Balsam of Tolu, 5 ; Socotrine Aloes, 2 ; Iodoform, 10 ; Methylated Ether (0·720), *q.s.* to produce 100.

BOUGIES OF IODOFORM AND EUCALYPTUS FOR GONORRHŒA (*Cheyne*).—Iodoform, 5 grains ; Oil of Eucalyptus, 10 minims ; Oil of Theobroma, 35 grains in each bougie, which should be 4 inches long and the diameter of No. 10 catheter.

This formula has been incorporated in the *B.P.C.*

Treatment.—The patient to pass water, then lie on his back. Introduce the bougie (first dipped in Eucalyptus Oil or Carbolic Oil 1 in 20), close the orifice with a pad of Boracic Lint covered with Gutta-percha tissue, secure in position with strapping. The patient should refrain from passing water for four or five hours. If the case be severe the introduction of the bougie is repeated after passing water. The next day use an injection of Zinc Sulphocarbolate, 2 grains to 1 fl. oz., for two or three days ; and on the third or fourth day, when the symptoms have entirely subsided, use an injection of Zinc Sulphate, 2 grains to 1 fl. oz. The treatment can be commenced as early as the first day or as late as the seventh day of the disease. The patient must abstain from Alcohol.—*B.M.J.* '80, ii. 125 ; *L.* '82, ii. 176, 213.

COLLODIUM IODOFORMI.—Iodoform, 1; Flexible Collodion, 9.—*Guy's.*

Official in Belg., Fr. and Jap., 1 in 10 by weight.

EMULSIO IODOFORMI.—Iodoform, in fine powder, 10 parts; Glycerin, 70 parts; Water, 20 parts. Rub the Iodoform to a smooth paste with the Glycerin, then add the Water.—*University.*

This has been incorporated in the *B.P.C.*

Iodoform, 1; Alcohol (90 p.c.), *q.s.* to moisten; Boiling Distilled Water, 2; Glycerin, 7.—*Great Northern* and *Guy's.*

GLYCERINUM IODOFORMI.—Iodoform (washed with 1 in 20 solution of Phenol to sterilise), 1; Glycerin, 9.—*King's.*

GOSSYPIUM IODOFORMI.—Iodoform, 70 grains; Glycerin, 10 minims; Cotton-Wool, 60 grains; Ether and Absolute Alcohol are used as solvents. Contains about 50 p.c. of Iodoform.

Iodoform Wool can also be obtained containing 10 p.c. and 20 p.c. **Iodoform Lint** 10 p.c.

Official in Austr. 10, 20, and 30 p.c.; Belg., Dutch and Span. 10 p.c.; Jap. 5 p.c.

INJECTIO IODOFORMI.—Iodoform, 1; Mucilage of Tragacanth, 2; Water, 7.—*University.*

This has been incorporated in the *B.P.C.*

Saturated Solution of Iodoform in Ether, ½ fl. oz.; Olive Oil, to 1 fl. oz.—*Central Throat.*

INSUFFLATIO IODOFORMI.—(For throat) Iodoform, 2; Dried Starch, 1; both in fine powder. (Aural) Iodoform, 1; Boric Acid, 3; both in fine powder.—*Throat.*

Iodoform, in fine powder, 1; Subnitrate of Bismuth, 1.—*Throat* (1894).

This has been incorporated in the *B.P.C.*

INSUFFLATIO IODOFORMI ET MORPHINÆ COMPOSITA.—Iodoform, 1 grain; Boric Acid, 1 grain; Morphine Acetate, ½ grain; Starch, to make 5 grains.—*Guy's.*

NEBULA IODOFORMI.—Iodoform, 40 grains; Ether (sp. gr. 0·735), 1 fl. oz.; dissolve. A strong antiseptic and detergent.

Iodoform, 8; Ether, *q.s.* to produce 100.—*B.P.C.*

LIQUID IODOFORM.—Caustic Potash, 35; Water, 25; dissolve, shake well, and add Oleic Acid, 50; Alcohol (95 p.c.), 30; then add with continuous agitation Sublimed Iodine, 30; decolorise by the addition of a few drops of solution of Caustic Potash. Set aside for several days in the dark, and decant the supernatant liquid. A yellowish liquid, with the odour of Iodoform, miscible with Water, Alcohol, Ether, and Chloroform, is thus obtained (*Blanchi*).—*P.J.* '07, ii. 509; '06, i. 668; *C.D.* '07, ii. 382; '06, i. 163.

PASTILLUS IODOFORMI.—Iodoform, in fine powder, 1 grain; Glycerin, 1 minim; Glyco-gelatin, 18 grains. For one pastille.

PIGMENTUM IODOFORMI.—Iodoform, 1; Ether, 8.—*Central Throat.*

PULVIS IODOFORMI COMPOSITUS. *Syn.* Naphthalin Iodoform.—Iodoform, 20; Boric Acid, 30; Naphthalene, 50; Oil of Bergamot, 2·5. This powder is used in many cases where a *diluted* preparation of Iodoform, for external purposes, is desired.—*U.S.N.F.*

Iodoform, in fine powder, 1; Boric Acid, 3. For external use only.—*East London for Children* and *St. Thomas's.*

This has been incorporated in the *B.P.C.*

UNGUENTUM IODOFORMI CUM ATROPINA.—Precipitated Iodoform, 60 grains; Atropine, 2 grains; Soft Paraffin, 1 oz.; heat the Atropine and Paraffin till dissolved; stir, and while cooling add the Iodoform.—*London Ophthalmic* and *St. Mary's.*

This has been incorporated in the *B.P.C.*

UNGUENTUM IODO-PARAFFINI.—Iodoform, 1; Eucalyptus Oil, 8; Soft Paraffin, 27; Hard Paraffin, 6.

Dissolve the Iodoform in the Oil at a slightly raised temperature, and mix with the other ingredients previously melted together.—*University* (1899).

Unguentum Iodoformi et Eucalypti.—Iodoform, 2; Oil of Eucalyptus, by weight, 19; Hard Paraffin, 64·50; Soft Paraffin, 14·50.—*B.P.C.*

VASOLIMENTUM IODOFORMI.—Iodoform, 1·5; Liquid Vasoliment, 98·5.—*Hager.*

Parogenum Iodoformi. *Syn.* Iodoform Vasoliment.—Iodoform, 3; Parogen, *q.s.* to produce 100.—*B.P.C.*

Iodoform, 1·5; Parogen, 98·5.—*P.J.* '06, i. 619; *Y.B.P.* '06, 147.

VASOLIMENTUM IODOFORMI DESODORATUM.—Iodoform, 1·5; Eucalyptol, 1·5; Liquid Vasoliment, 97.—*Hager.*

Parogenum Iodoformi Deodoratum. *Syn.* Deodorised Iodoform Vasoliment. Iodoform, 3; Eucalyptol, 3; Parogen, *q.s.* to produce 100.—*B.P.C.*

Iodoform, 1·5; Eucalyptol, 1·5; Parogen, 97.—*P.J.* '06, i. 619; *Y.B.P.* '06, 147.

Dissolve the Iodoform in the Parogen by warming cautiously, and add the Eucalyptol.

EKA-IODOFORM.—A yellow-lemon crystalline lustrous powder, insoluble in Water. Soluble 1 in 75 of Alcohol (90 p.c.); 1 in 8 of Ether; 1 in 13½ of Chloroform. Stated to be a mixture of Iodoform and Paraformaldehyde. Introduced as a substitute for Iodoform.

Iodofan.—A reddish crystalline powder without taste or smell, possessing anti-bacterial and deodorising properties, introduced as a dressing.—*B.M.J.E.* '07, ii. 63.

IODOFORMIN.—A combination of Iodoform and Hexamethylenetetramine containing about 75 p.c. of the former. A white or pale yellow powder, insoluble in Water; soluble in 1 in 170 of Alcohol (90 p.c.); 1 in 350 of Ether; 1 in 72 of Chloroform; also soluble in Acetone. Boiling Water, Acids, and Alkalis decompose it. Introduced as an Iodoform substitute.—*J.S.C.I.* '95, 820; '96, 469; '97, 757; *C.D.* '95, ii. 438; *P.J.* '95, ii. 455; '97, ii. 82; *L.* '96, i. 856.

Iodoformal (Iodoformin Ethyl Iodide).—In yellow crystals or powder, insoluble in Water. Antiseptic.

IODOFORMOGEN (Iodoform Albuminate).—A pale lemon-yellow powder, possessing a faint odour of Iodoform. Insoluble in Water, Alcohol (90 p.c.), Ether or Chloroform. Used as a dusting powder. Introduced as an Iodoform substitute.—*B.M.J.* '98, ii. 1066; *B.M.J.E.* '98, i. 63.

DI-IODOFORM (Ethylene Periodide).—Yellow prismatic needles. Insoluble in Water, soluble in Chloroform. Introduced as a substitute for Iodoform.—*L.* '93, ii. 1355; *Pr.* lii. 126; *P.J.* (3) xxiv. 622. It is official in *Fr. Codex* (1908).

IODOL Tetraiodpyrrol C_4I_4NH, eq. 566·18.—A light brown microcrystalline powder, without taste, having a faint odour, and containing 90 p.c. of Iodine. It should be kept in well-closed glass bottles of a dark amber tint in a cool place and protected as far as possible from the light.

Solubility.—Nearly insoluble in Water; 1 in 18 of Alcohol (90 p.c.), 1 in 150 of Chloroform, 1 in 1½ of Ether, 1 in 155 of Glycerin. It is stated to be soluble 1 in 3 in Absolute Alcohol, but the sample we examined gave 1 in 6½.

Medicinal Properties.—Antiseptic; used for the same purposes as Iodoform, but it is free from the objectionable odour of the latter, and is stated not to be so poisonous. 1 p.c. of Menthol is added in nasal diseases to cover the odour of Iodol.

Foreign Pharmacopœias.—Official in Ital., Mex., Russ., Span., and U.S.; not in the others.

Pomada de Yodol (Mex.), Iodol, 1; Vaseline, 9.

Tests.—Iodol does not undergo decomposition when heated to temperatures up to 100° C. (212° F.), but at about 150° C. (302° F.) it is decomposed, yielding violet coloured vapours of Iodine. When warmed with Potassium or Sodium Hydroxide Solution and Zinc foil, it evolves vapours of Pyrrol, which impart a bright red to a deep carmine-red colour to a splinter of pine wood moistened with Hydrochloric Acid.

A weighed quantity of 0·5 gramme should leave no weighable residue when ignited with free access of air. The *U.S.P.* states that, when ignited, it should leave not more than 0·1 p.c. of residue, indicating the limit of inorganic impurities or mineral residue. When shaken with Water and filtered the filtrate should yield not more than the slightest opalescence with Silver Nitrate Solution, indicating the limit of Hydrochloric Acid and soluble Iodides, nor any coloration with Hydrogen Sulphide, indicating the absence of heavy metals, *e.g.*, Copper, Lead. When Water, which has been shaken with the sample is in turn shaken with Carbon Bisulphide, the latter should be coloured at the most a pale yellow, but not a violet.

IODOLENE (Iodol Albuminate).—A light yellow powder, insoluble in Water and in Alcohol (90 p.c.). It occurs in two forms, one for internal use containing 10 p.c. Iodol, the other for external use containing 36 p.c. Antiseptic. Introduced as an Iodoform substitute. Has been used internally in syphilis, but has sometimes caused iodism.—*B.M.J.E.* '02, i. 91.

Dose.—15 to 30 grains = 1 to 2 grammes.

IODUM.

IODINE.

I, eq. 125·90.

FR., IODE SUBLIMÉ; GER., JOD; ITAL., JODO; SPAN., YODO.

Heavy, greyish-black, rhombic plates or prisms, possessing a metallic lustre and a characteristic peculiar odour. Commercial resublimed Iodine, if in large dry scales, may be reckoned at 100 p.c. It is prepared from 'kelp' (the ashes of sea-weeds), and also from naturally occurring Iodides and Iodates. It should be kept in well-stoppered glass bottles and in a cool atmosphere, as it volatilises considerably at ordinary temperatures.

Solubility.—1 in 7000 of Water; 1 in 12 of Alcohol (90 p.c.); 1 in 4 of Ether; 1 in 30 of Chloroform; 1 in 6 of Carbon Bisulphide; 1 in 65 of Glycerin; soluble in an aqueous solution of Potassium Iodide.

Medicinal Properties.—Antiseptic, alterative, deodoriser, disinfectant; locally it is irritant or vesicant according to the strength employed. Internally, largely used in form of Iodide, seldom as Iodine, in chronic rheumatism and in chronic inflammation of various kinds; to promote absorption in hepatic and splenic enlargements, and in dropsies (pleuritic effusion, hydrocele, etc.). In the form of Potassium Iodide (10 to 30 grains three times a day), it is specific in the later stages of syphilis; and in 30-grain doses three times a day it is very useful in aneurism, its most striking effect being the relief of the aneurismal pain; valuable in actinomycosis. Efficacious in all chronic inflammatory conditions; caution, however, is required, as it may, when given in very large doses, occasionally cause wasting of healthy glands, such as the mammæ and testes. 1 of the Tincture with 50 of Water forms an antiseptic lotion for washing out cysts. Externally the **solution, ointment,** and **tincture** are applied in chronic and parasitic skin diseases, in phthisis, pleurisy, pericarditis and bronchitis as a counter-irritant, and for chilblains; the Tincture, either neat or diluted with an equal quantity of Water, is injected into the scrotal sac to cure hydrocele; Morton's Fluid is injected into the sac of spina bifida. A few drops of the Tincture in half a pint of hot Water may, along with Creosote or volatile Oils, be **inhaled** in some forms of chronic bronchitis and phthisis, and in the throat affection of scarlatina and measles. It is employed as a **gargle,** 1 or 2 of Tincture in 32 of Water for ulceration of the throat. One or two drops of the Tincture in a tablespoonful of Water every 30 minutes are often successful in checking vomiting, including that of pregnancy. *See* also under 'Potassii Iodidum.'

Half a syringeful of a solution of Iodine 1, Potassium Iodide 2, and Water 50, injected into the genital region in tuberculous peritonitis.—*B.M.J.E.* '99, ii. 44.

Stated (*P.J.* '04, ii. 967) to form an excellent general tonic before meals in tuberculosis, a teaspoonful of the following mixture being recommended: Tincture of Iodine (*Fr. Codex*), 20; Potassium Iodide, 2; Glycerin, 40; Syrup of Orange, 50; Water, to 1000. 1 minim doses of the Tincture (*B.M.J.* '04, ii, 1405), very successful in sea-sickness.

For the relief of troublesome cough of phthisis Dr. Coghill's famous formula (*Edin. Med. Jour.* '05, i. 465) is useful:—Tincture of Iodine (Ethereal), 2 drm.; Acid Carbolic, 2 drm.; Creosote or Thymol, 1 drm.; Alcohol (90 p.c.) to 1 oz.

Equal parts of the liniment and tincture applied as a paint in pleurisy of phthisis.—*Edin. Med. Jour.* '05, i. 468.

A case of acute poisoning with fatal result caused by drinking 4 oz. of Liniment of Iodine.—*L.* '05, i. 793.

In form of tincture, strongly recommended in carbolic acid poisoning; in large doses, possibly up to drm. doses and more in severe cases.—*L.* '07, ii. 293.

Graves' disease treated with marked success by parenchymatous injections of Iodine and Ergotine.—*B.M.J.E.* '06, ii. 87. If employed from the beginning in typhoid, it acts almost like a specific, shortening the duration of the illness, and modifying favourably most of the symptoms. Given as *B.P.* tincture 3 to 15 minims in 1 or 2 fl. drm. of Rum or Cognac in 1 or 2 oz. of Water with Sugar, 3 or 4 times in 24 hours.—*B.M.J.* '07, ii. 143.

Dose.—$\frac{1}{16}$ to $\frac{1}{4}$ grain = 0·004 to 0·015 gramme.

Ph. Ger. maximum single dose, 0·02 gramme; maximum daily dose, 0·06 gramme.

Prescribing Notes.—*Very rarely given internally in the solid form, except when loosely combined as in the alkaloidal Periodides, see p.* 276. *Occasionally administered as Tincture, which should be well diluted. The Pasta Iodi et Amyli is less irritating than many of the other Iodine preparations.*

Iodine and solutions containing free Iodine stain the skin a yellowish-brown; this can be removed by Caustic or Carbonated Alkali or Sodium Thiosulphate. Several so-called colourless and non-staining preparations of Iodine have been suggested, but their medicinal action cannot be due to free Iodine, but to the compound of Iodine which is produced in each case, e.g., combinations of Iodine and Oleic Acid and the fixed and volatile Oils; also the Decolorised Tincture of Iodine (*B.P.C.*) *which is practically a solution of Ammonium Iodide and Iodate.*

In all the galenical preparations containing Iodine, Potassium Iodide is a constant ingredient, presumably with the intention of assisting the solution of the Iodine. In the case of aqueous solutions this is necessary, and an excess of Iodide is advantageous. In spirituous solutions, however, where the Iodide is scarcely more soluble than the Iodine, a much smaller quantity (*if any*) *is required.*

Incompatibles.—Alkalis, Metallic salts, Alkaloids.

Official Preparations.—Liquor Iodi Fortis, Tinctura Iodi and Unguentum Iodi. Used in the preparation of Syrupus Ferri Iodidi. Arsenic, Mercury, Potassium, Sodium, and Sulphur, Iodides are official.

Not Official.—Causticum Iodi, Chloroform Iodi, Collodion Iodi, Collodium Iodatum, Gossypium Iodatum, Coghill's Inhalation Fluid, Inhalatio Iodi cum Conio, Glycerinum Iodi, Injectio Iodi, Lugol's Solution, Lugol's Caustic, Liquor Ammoniæ Iodidi, Liquor Iodi, Liquor Iodi Compositus, Liquor Iodi Carbolatus, Liquor Iodi Glycerinus, Nebula Iodi Co., Nebula Iodi et Mentholis, Parogenum Iodi also Dilutum, Pasta Iodi et Amyli, Pigmentum Iodi, Pigmentum Iodi cum Aconito Mite, Pigmentum Iodi cum Aconito Forte, Pigmentum Iodi Oleatum, Pigmentum Iodi Carbolisatum, Pigmentum Mandl, Pigmentum Picis cum Iodo, Sirop Iodotannique, Sirop Iodotannique Phosphaté, Tinctura Iodi, Tinctura Iodi Decolorata, Unguentum Iodi Denigrescens, Vapor Iodi, Vapor Iodi Compositus, Vapor Iodi Etherealis, Vapor Iodi et Acidi Carbolici, Vasolimentum Iodi, Iodine Leaf, Iodi Trichloridum, Iodipin and Iothion.

Antidotes.—Emetics aided by demulcent drinks, Starch, Flour, etc., diffused in Water; Hypodermic Injection of Morphine to relieve pain.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—Iodine when heated evolves violet coloured vapours, which again condense on cooling to crystals having a metallic lustre. It has a sp. gr. of about 4·948 and a m.p. of 114° to 115° C. (237·2° to 239° F.). Its aqueous solution affords with Starch Mucilage a dark blue coloration, disappearing on heating the solution and reappearing as the solution cools. It is decolorised by Sodium Thiosulphate Solution and by Sulphurous Acid. When a small quantity is dissolved in Alcohol (90 p.c.) and the solution is almost decolorised with Potassium or Sodium Hydroxide Solution, leaving a sufficient quantity of Iodine to form a slight but distinct excess, the mixture when warmed to about 60° C. (140° F.) yields the characteristic penetrating odour and a pale yellow precipitate of Iodoform. When boiled with Potassium Hydroxide Solution, cooled and acidified with Nitric Acid, it yields with Silver Nitrate Solution a curdy yellow precipitate, insoluble in Nitric Acid, practically insoluble in Ammonia Solution, soluble in Potassium Cyanide Solution. The *B.P.* only includes the Starch Mucilage test for Iodine. It is officially required to contain at least 98·7 p.c. of pure Iodine, as determined by titration with Volumetric Sodium Thiosulphate Solution. The *U.S.P.* requires that it should contain not less than 99·0 p.c. of pure Iodine and the *P.G.* at least 98·94 p.c.

The more generally occurring impurities are fixed matter, excess of moisture, Iodine Cyanide, Chloride or Bromide. The production of a perfectly bright solution when the Iodine is dissolved in Chloroform is officially taken to indicate the absence of moisture. The *B.P.* requires that it shall sublime without residue, and that no slender, colourless prisms, emitting a pungent odour, shall accompany the first portions of the sublimate; indicating the absence of Iodine Cyanide. Both *U.S.P.* and *P.G.* include a specific test for Cyanogen compounds, extracting with Water, decolorising the filtrate and applying the Ferrous Sulphate and Sodium Hydroxide Solution test; the *U.S.P.* employs Tenth-normal Volumetric Sodium Thiosulphate Solution to decolorise the free Iodine, the *P.G.* Sulphurous Acid; the *U.S.P.* uses Ferrous Sulphate Solution and Sodium Hydroxide Solution (5 p.c.), the *P.G.* a crystal of Ferrous Sulphate, a drop of Ferric Chloride Solution, and Sodium Hydroxide Solution (15 p.c.) both Pharmacopœias require that no blue coloration should be produced on the addition of a slight excess of Hydrochloric Acid; Chloride and Bromide would appear in the aqueous extract, and are precipitated with Silver Nitrate Solution; the precipitated Iodide remains insoluble when treated with Ammonia Solution, the Chloride and portion of the Bromide if present passing into the ammoniacal solution; the latter is required to yield not more than a slight opalescence, and certainly no precipitate when rendered slightly acid with Nitric Acid.

Ferrous Sulphate and Sodium Hydroxide.—Triturate 0·5 gramme of finely-powdered Iodine with 20 c.c. of Water and filter the solution. To one half of this solution in a test-tube carefully add Tenth-normal Volumetric Sodium Thiosulphate Solution, until the solution is just decolorised. Then add a few drops of Ferrous Sulphate T.S. and subsequently a little Sodium Hydroxide T.S. and heat the mixture gently. On now adding a slight excess of Hydrochloric Acid the liquid should not assume a blue colour (absence of Iodine Cyanide), *U.S.P.*; triturate ½ gramme of the sample with 20 c.c. of Water, filter and decolorise a portion of the filtrate with Sulphurous Acid. Warm a portion of the decolorised liquid with a crystal of Ferrous Sulphate, a drop of Ferric Chloride T.S. and Sodium Hydroxide Solution (15 p.c.). This mixture shall yield no blue coloration on the addition of an excess of Hydrochloric Acid, *P.G.*

Silver Nitrate and Ammonia Solution.—To the other half of the aqueous filtered solution obtained in the preceding *U.S.P.* test add a slight excess of Silver Nitrate T.S., shake the liquid actively, allow the precipitate to subside, and having poured off the supernatant liquid completely, shake the precipitate with a mixture of 1 c.c. of Ammonia Water and 9 c.c. of Water, and filter. Upon the addition of a slight excess of Nitric Acid to the filtrate not more than a slight opalescence should make its appearance, *U.S.P.*; add to the portion of the filtrate remaining from the above *P.G.* test an excess of Ammonia Solution and of Silver Nitrate Solution, and filter. The filtrate when acidified with Nitric Acid shall yield at most an opalescence, but not a precipitate, *P.G.*

Volumetric Determination.—A solution of 1 gramme of Iodine and 2 grammes of Potassium Iodide in 50 c.c. of Water should require for decolorisation at least 78·4 c.c. of Volumetric Solution of Sodium Thiosulphate, *B.P.*; 0·2 gramme of Iodine and 1 gramme of Potassium Iodide dissolved in 20 c.c. of Water should require for decolorisation at least 15·6 c.c. of Tenth-normal Volumetric Solution of Sodium Thiosulphate, *P.G.* About 0·5 gramme of Iodine is accurately weighed and dissolved with 1 gramme of Potassium Iodide in 50 c.c. of Water and titrated with Tenth-normal Volumetric Sodium Thiosulphate Solution until the solution is decolorised. The number of c.c. of the Volumetric Solution required when multiplied by 1·259 and divided by the weight of Iodine taken gives the percentage of pure Iodine present, *U.S.P.*

Preparations.

LIQUOR IODI FORTIS. Strong Solution of Iodine. Liniment of Iodine, *B.P.* '85.

Iodine, $1\frac{1}{4}$; Potassium Iodide, $\frac{3}{4}$; Distilled Water, $1\frac{1}{4}$; Alcohol (90 p.c.), 9. (about 1 of Iodine in $8\frac{1}{2}$)

Formerly called Linimentum Iodi. Alcohol (90 p.c.) and Distilled Water replace the Rectified Spirit and Glycerin. The Potassium Iodide is increased.

Foreign Pharmacopœias.—Official in Dutch (Solutio Lugoli), Iodine 1, Potassium Iodide 2, Water 497; Norw. (Solutio Superiodeti Kalici), Iodine 1, Potassium Iodide 2, Distilled Water 97; Port. (Soluto Iodo-iodotado), Tincture of Iodine 6, Potassium Iodide 1, Water 13; U.S. (Liquor Iodi Co.), Iodine 1, Potassium Iodide 2, Distilled Water 17. All by weight. Not in the others.

Tests.—Strong Solution of Iodine has a sp. gr. of 1·008 to 1·012; contains 11·7 p.c. w/v of Iodine as determined by titration with Volumetric Sodium Thiosulphate Solution; about 6·8 p.c. w/v of total solids and 65 p.c. w/v of Absolute Alcohol as determined by the distillation method given under Tinctura Iodi.

TINCTURA IODI. TINCTURE OF IODINE.

Iodine, $\frac{1}{2}$; Potassium Iodide, $\frac{1}{2}$; Distilled Water, $\frac{1}{2}$; Alcohol (90 p.c.), *q.s.* to yield 20. (1 of Iodine in 40)

The Iodine and Iodide are first dissolved in a small quantity of Water, as suggested in previous editions of the *Companion.*

Dose.—2 to 5 minims = 0·12 c.c. to 0·3 c.c.

Ph. Ger. maximum single dose, 0·2 gramme; maximum daily dose, 0·6 gramme of the 1 in 10 Tincture.

Tinctura Iodinei (*Ph. Edinburgh*).—1 of Iodine in 16 of Alcohol (90 p.c.). It resembles the Tinctures of the Foreign Pharmacopœias in being *without* Potassium Iodide.

Tinctura Iodi Ætherea (*Sawyer*).—1 of Iodine in 40 of pure Ether.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan. (Solutio Iodi Spirituosa Concentrata), Dutch (Solutio Iodii Spirituosa), Fr., Port. and Swiss, 1 and 9. Ital., Jap. and Mex., 1 and 12; Mex. has also (Tintura de Yodo Yodurado), Potassium Iodide 1, Tincture of Iodine 9. Norw. and Swed. (Sol. Iodi Spirituosa) 1 in 20; Swed. also includes Solutio Iodii Concentrata 1 in 10. Ger., Hung., Russ. and Span. 1 and 10. U.S., Iodine 7, Potassium Iodide 5, Alcohol to 100.

Tests.—Tincture of Iodine has a sp. gr. of 0·875 to 0·880. It is officially required to contain 2·47 p.c. w/v of Iodine as determined by titration with Volumetric Sodium Thiosulphate Solution. It contains about 2·5 p.c. w/v of total solids and about 86·0 p.c. w/v of Absolute Alcohol. Before determining the Alcohol by distillation it is necessary to fix free Iodine. This may be accomplished by the addition of Sodium Hyposulphite Solution (50 p.c.), the liquid being then neutralised with Potassium or Sodium Hydroxide.

UNGUENTUM IODI. IODINE OINTMENT.

Iodine, 20 grains; Potassium Iodide, 20 grains; Glycerin, 60 grains; Lard, 400 grains. (1 of Iodine in 25)

B.P. 1885 was 1 in 31.

Foreign Pharmacopœias.—Dutch, Iodine 2, Potassium Iodide 3, Water 5, Ointment 90; Fr. (Pommade d'Iodure de Potassium Ioduré), Iodine 1, Potassium Iodide 5, Benzoated Lard 40, Water 4; Hung., Tincture of Iodine 1, Simple Ointment 9; Mex. (Pomada de Yodo), Iodine 1, Lard 30; Port. (Pomada de Iodeto de Potassio Iodada), Iodine 1, Potassium Iodide 4, Water 5, Lard 40; Span. (Pomada de Ioduro Potasico Iodado), Iodine 2, Potassium Iodide 2, Glycerin 6, Lard 40; U.S., Iodine 4, Potassium Iodide 4, Glycerin 12, Benzoinated Lard 80. Mix. Not in the others.

Not Official.

CAUSTICUM IODI.—Iodine, 180 grains; Potassium Iodide, 60 grains; Alcohol (90 p.c.), 1 fl. oz.

Used in cases of lupus and of indolent (*i.e.* non-phagedænic) tertiary syphilitic ulcers.

CHLOROFORMUM IODI.—Iodine, 1; Chloroform, *q.s.* to produce 10.—*Martindale.*

This has been incorporated in the *B.P.C.*

COLLODIUM IODATUM (*U.S.N.F.*).—Iodine, 1; Flexile Collodion, 19.

Collodium Iodi.—Iodine, 6·50; Acetone Collodion, *q.s.* to produce 100.—*B.P.C.*

GOSSYPIUM IODATUM.—Dry white wool impregnated with Iodine, and containing about 8 p.c. of the latter (Coton Iodé, *Fr. Codex*, at least 4 p.c.).

INHALATIO IODI C. CONIO.—½ to 1 fl. drm. of Succus Conii added to Vapor Iodi.

GLYCERINUM IODI (Morton's Fluid).—Iodine, 10 grains; Potassium Iodide, 30 grains; Glycerin, 1 fl. oz.—*Guy's.*

For spina bifida, inject 30 minims, without allowing the fluid contents of the tumour to escape.—*B.M.J.* '85, i. 1098; '86, i. 874; '87, ii. 1275.

Liquor Iodi Glycerinus (Morton's).—Iodine, 10 grains; Potassium Iodide, 30 grains; Glycerin, 1 oz. Dissolve.—*Pharm. Form.*

Note.—It is advisable to dissolve the Iodine and Iodide in about ½ drm. of Water before adding the 7½ drm. of Glycerin.—*Pharm. Form.*

This has been incorporated in the *B.P.C.*, as follows:—Glycerinum Iodi. *Syn.* Injectio Iodi; Morton's Fluid.—Iodine, 2; Potassium Iodide, 6; Distilled Water, 5; Glycerin, *q.s.* to produce 100.—*B.P.C.*

INJECTIO IODI.—Solution of Iodine, 1 fl. drm.; Water, to 20 fl. oz.—*Samaritan.*

PHENOL IODATUM. *See* p. 36.

LUGOL'S CAUSTIC.—Iodine, 1; Potassium Iodide, 1; Water, 2.

LUGOL'S SOLUTION.—Iodine, 20 grains; Potassium Iodide, 30 grains; Water, 1 oz. This was official as Liquor Iodi in *B.P.* '85, but omitted in '98. The proportions are about equal to 1, 1½, and 22. *See* also Liquor Iodi Fortis.

LIQUOR IODI (*B.P.* '85).—Iodine, 10; Iodide of Potassium, 15; Distilled Water, *q.s.* to produce 200.

This has been incorporated in the *B.P.C.* under the title **Liquor Iodi Dilutus.**

LIQUOR IODI COMPOSITUS (*U.S.P.*).—Iodine, 5; Potassium Iodide, 10; Distilled Water, *q.s.* to make 100 by weight.

LIQUOR IODI CARBOLATUS. *Syn.* Boulton's Solution; French Mixture.—Compound Solution of Iodine (*U.S.P.*), 15; Carbolic Acid, liquefied by gentle heat, 5·5; Glycerin, 165, Water, *q.s.* to make 1000.—*U.S.N.F.*

NEBULA IODI COMPOSITA.—Iodine, 1 grain; Carbolic Acid, 4 grains; Spray Oil, 1 fl. oz.—*Bournemouth Formulary.*

Iodine, 1; Carbolic Acid, 1; Liquid Paraffin, *q.s.* to produce 100.—*B.P.C.*

NEBULA IODI ET MENTHOLIS.—Iodine, 1 grain; Menthol, 1 drm.; White Petroleum Oil, *q.s.* to make 1 fl. oz.—*A.Ph.F.*

Iodine, 2; Menthol, 4; Liquid Paraffin, *q.s.* to produce 100.—*B.P.C.*

PASTA IODI ET AMYLI.—Starch, 1 oz.; Glycerin, 2 fl. oz.; Water, 6 fl. oz.; boil together, and when nearly cold add Solution of Iodine, *B.P.* '85, 1 fl. oz.—*University.*

This has been incorporated in the *B.P.C.*

PIGMENTUM IODI.—Iodine, 2; Potassium Iodide, 1; Glycerin, 4. Used to destroy vegetable parasites.

Tincture of Iodine, 1; Strong Solution of Iodine, 1.—*Great Northern, Middlesex, University.*

This is equivalent to 1 in 24 of Iodine; most of the Hospitals have a Pigmentum, varying in strength from 1 in 3 to 1 in 34, some with Glycerin, others without. Pigmentum Mandl is 1 in 73.

Iodine, 100; Potassium Iodide, 100; Water, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

PIGMENTUM IODI CUM ACONITO MITE.—Tincture of Iodine, 1; Tincture of Aconite, 1.—*R.D.H.*

PIGMENTUM IODI CUM ACONITO FORTE.—Strong Solution of Iodine, 1; Liniment of Aconite, 1.—*R.D.H.*

PIGMENTUM IODI CARBOLISATUM.—Iodine, 4 grains; Iodide of Potassium, 4 grains; Carbolic Acid, 4 grains; Glycerin, 4 fl. drm.; Water, to 1 fl. oz.

Dissolve the Iodine and the Iodide of Potassium in the Water, and then add the Carbolic Acid dissolved in the Glycerin.

Note.—This is sometimes employed at half strength.—*Central Throat.*

This has been incorporated in the *B.P.C.*

Pigmentum Iodi Oleatum.—Iodine, 50 grains; Oleic Acid, to 1 fl. oz.—*Central Throat.*

PIGMENTUM MANDL.—Iodine, 6 grains; Potassium Iodide, 20 grains; Oil of Peppermint, 5 minims; Glycerin, to 1 fl. oz.—*Throat.* Use, in granular pharyngitis.

In answer to an inquiry for the correct composition of Mandl's solution, several formulas were given. That given in *Hager* is Carbolic Acid and Iodine, of each, 1; Potassium Iodide, 2; Glycerin, 100, but all the formulas sent in reply omitted the Carbolic Acid.—*P.J.* '02, i. 156, 181, 184, 200.

PIGMENTUM PICIS CUM IODO (Coster's Paste).—Iodine, 120 grains; Rectified Oil of Tar, 1 fl. oz.—*Middlesex;* dissolve cautiously, applying a gentle heat as required. The Oil of Tar is inflammable.

Specially recommended in ringworm.

This has been incorporated in the *B.P.C.*

SIROP IODOTANNIQUE (Fr.).—Iodine, 2; Tannin, 4; Distilled Water, 360; Refined Sugar, 640; all by weight.

Powder the Iodine and introduce it, with the Tannin and Water, into a flask, which heat on a water-bath at a temperature of 60° C. until a drop of the solution ceases to give a blue colour with starch paper; then dissolve the Sugar in the solution.

SIROP IODOTANNIQUE PHOSPHATÉ (Fr.).—Monocalcic Phosphate, 2; Iodotannic Syrup, 98.

TINCT. IODI (*P.E.*).—Iodine, 2½; Rectified Spirit, 40. Dissolve the Iodine in the Spirit with the aid of a gentle heat and agitation.

TINCTURA IODI DECOLORATA.—Iodine, 250 grains; Alcohol (90 p.c.), 5½ fl. oz.; dissolve with a gentle heat; when cold add Stronger Solution of Ammonia, 10 fl. drm.; keep the mixture in a warm place until decolorised, after which dilute with Alcohol (90 p.c.) to make 20 fl. oz.—*B.P.C. Formulary* 1901 incorporated in *B.P.C.* as follows:—Iodine, 2·50; Strong Solution of Ammonia, 6·25; Alcohol, *q.s.* to produce 100.

Liquor Ammoniæ Iodidi (Simpson).—Liq. Ammon. Fortis, 2 fl. oz.; Iodine, 10 grains; Potassium Iodide, 20 grains; Alcohol (90 p.c.), 1 fl. oz.; dissolve.

Tinctura Iodi Decolorata.—Iodine, 83; Sodium Thiosulphate (*U.S.P.*), 83; Water, 100; Stronger Ammonia Water (*U.S.P.*), 65; Alcohol (95 p.c.), *q.s.* to produce 1000.—*U.S.N.F.*

UNGUENTUM IODI DENIGRESCENS. *Syn.* Stainless Iodine Ointment.—Iodine, 1 oz.; Soft Paraffin, 19 oz. Powder the Iodine, melt the Paraffin by heat, add the Iodine and continue to heat the mixture, stirring until the Iodine is combined. Remove the heat and stir the preparation until cold.—*Canadian Formulary*, also in *Pharm. Form.*

This has been incorporated in the *B.P.C.*

VASOLIMENTUM IODI.—Iodine, 10·5; Oleic Acid, 50; Alcoholic Ammonia, 25; Liquid Paraffin, 100; after solution is effected. The weight is then made up to 175 with Alcohol.—*Pharm. Centr. XLI.* 756; *Y.B.P.* '01, 212.

Parogenum Iodi. *Syn.* Iodine Vasoliment.—Iodine, 10; Oleic Acid, 40; Liquid Paraffin, 40; Ammoniated Alcohol (10 p.c.), 10.—*B.P.C.*

VASOLIMENTUM IODATUM.—Iodine, 6; Liquid Vasoliment, 94.—*Hager.*

Parogenum Iodi Dilutum. *Syn.* Diluted Iodine Vasoliment.—Iodine Parogen, 6; Parogen, 4.—*B.P.C.*

VAPOR IODI (Inhalation of Iodine).—Tincture of Iodine, 1 fl. drm.; Water, 1 fl. oz.; mix in a suitable apparatus, and having applied a gentle heat, let the vapour that arises be inhaled. This was official in *B.P.* '67 and '85, but omitted in '98, and has now been incorporated in the *B.P.C.*

Tincture of Iodine 10 drops for each dry inhalation, without the aid of heat.

COGHILL'S INHALATION FLUID.—Iodine, 33 grains; Ether, 8 fl. drm.; Carbolic Acid, 8 fl. drm.; Creosote (or Thymol), 4 fl. drm.; Rectified Spirit, to 4 fl. oz.—*Pharm. Form.* (1 in 53)

VAPOR IODI ÆTHEREALIS.—Iodine, 3 grains; Ether, 2 drm.; Carbolic Acid, 2 drm.; Creosote, 1 drm.; Alcohol (90 p.c.), 3 drm. Thymol may be substituted for Creosote.—*Martindale.* (1 in 146)

Vapor Iodi Etherealis.—Iodine, 0·05; Ether, 25; Carbolic Acid, 25; Creosote, 12·50; Alcohol, 37·50.—*B.P.C.* (1 in 2000)

Altered in *B.P.C. Supplement* from 0·05 of Iodine to 0·686; or prepared by mixing Ethereal Tincture of Iodine, 25; Carbolic Acid, 25; Creosote, 12½; and Alcohol (90 p.c.), *q.s.* to make 100.

VAPOR IODI ET ACIDI CARBOLICI.—Tincture of Iodine, 2 fl. drm.; Carbolic Acid, 2 drm.; Thymol, 1 drm.; Chloroform, 30 minims; Alcohol (90 p.c.), to produce 8 fl. drm. 10 to 20 drops twice or three times daily on a dry inhaler.—*King's.*

VAPOR IODI COMPOSITUS.—Tincture of Iodine, ½ oz.; Creosote, 1 fl. drm.; Liquefied Phenol, 1 fl. drm.; Rectified Spirit, ½ fl. oz. For dry inhalation.—*Great Northern.*

IODINE LEAF.—An ingenious method for the local application of Iodine as a counter-irritant, being two sheets of filter paper, one saturated with a solution of Potassium Iodide and Iodate, and the other with Acid Potassium Sulphate. When the papers are moistened and brought together, Iodine is liberated.—*L.* '02, i. 328.

Sajodin.—A white powder, free from smell or taste, stated to contain 26 p.c. of Iodine; Dose, 2 to 3 grammes daily in syphilis.—*B.M.J.E.* '07, 1, 64.

Iodalbin.—Iodine in combination with Albumen, stated to contain 21·5 p.c. of Iodine; a reddish powder, insoluble in Water and Alcohol; but is dissolved by alkaline solutions. Dose, 5 grains.

IODI TRICHLORIDUM. Iodine Trichloride. ICl_3, eq. 231·47.—Orange-yellow crystalline masses evolving a powerful penetrating chlorinous odour. It should be kept in well-stoppered glass bottles of a dark amber tint in a cool atmosphere and protected as far as possible from the light.

Solubility.—1 in 1 of Water; 1 in 1 of Alcohol (90 p.c.).

Powerful antiseptic and disinfectant.

Tests.—Iodide Trichloride melts at about 25° C. (77° F.). When heated with Oxalic Acid it yields violet coloured vapours of Iodine.

The 1 in 10 aqueous solution affords on the addition of a considerable excess of Sulphuric Acid a whitish precipitate, changing to yellow.

It contains theoretically 54·39 p.c. of Iodine. A weighed quantity of 0·1 gramme mixed with 2 grammes of Potassium Iodide, and dissolved in 30 c.c. of Water, requires at least 15·0 c.c. of Deci-normal Volumetric Sodium

Thiosulphate Solution for decolorisation. A weighed quantity of 0·1 gramme should leave no weighable residue when ignited with free access of air.

IODIPIN.—Under this title two Iodine addition-compounds of Sesame Oil are known: one containing 10 p.c. Iodine, a pale straw coloured transparent oily fluid; the other 25 p.c. a yellowish-brown viscid fluid. Both possess an oleaginous odour and taste, are insoluble in Water and in Alcohol (90 p.c.); soluble in all proportions of Ether and of Chloroform.

Medicinal Properties.—Recommended in syphilis, bronchitis, bronchial asthma, emphysema and pleuritis; also in syphilitic affections of the eye.—*B.M.J.E.* '00, ii. 80; '01, ii. 79; *M.A.* '02, 38.

As a test for the functional activity of the stomach.—*B.M.J.E.* '99, ii. 81.

In the treatment of fibroids growing at the menopause, Iodine by the mouth used to be successfully employed; the modern idea is in favour of the employment of hypodermic injections of Iodine in organic combination. Iodipin has been shown (*B.M.J.* '04, ii. 1085) to give relief of symptoms in some cases. The question of the originality of this hypodermic method has given rise to a good deal of correspondence (*M.P.* '04, ii. 476, *et seq.*). In gonorrhœal rheumatism (*B.M.J.E.* '04, ii. 75) 10 grammes have been injected every other day in the region of the affected parts.

No case of tertiary ulceration should be despaired of until Iodipin has been tried; its full therapeutic value can be secured by oral administration; is well borne; produces no iodism or depression.—*F.T.* '07, 45.

Prescribing Notes.—*May be given in* **capsules,** *each capsule containing* 2 *grammes* = 30 *grains of the* 25 *p.c. preparation; or in* **emulsion,** *made with Gum Acacia and flavoured with Oil of Cinnamon or Peppermint. It may also be administered* **subcutaneously,** *as in the treatment of syphilis, or by inunction.*

Dose.—1 to 6 fl. drm. = 3·6 to 21·0 c.c. of the 10 p.c. solution administered by the mouth. 150 to 300 grains = 10 to 20 grammes administered daily subcutaneously.

In cases of uterine fibroid, starting with 1 c.c. injected into the buttock and increasing up to 5 and 7 c.c. of the 25 p.c., injected into either buttock alternately, then 10 c.c. of the 10 p.c., and finally 10 c.c. of the 25 p.c., which latter is considered the full dose of Iodipin for ten consecutive days' use.—*L.* '03, i. 959.

IOTHION. $C_3H_5I_2OH$, eq. 309·41.—This substance forms a pale yellow syrupy liquid, insoluble in Water, soluble in Alcohol (90 p.c.), Chloroform and Ether, and mixes with most oils and fats. It contains about 80 p.c. of Iodine, and, being absorbed with facility by the skin, it forms a ready means of administering Iodine. Chemically it is Di-iodo-hydroxypropane. It is stated to have been used successfully in periostitis and in chronic inflammation of the joints. It may be painted on the skin, either pure or diluted with an equal quantity of oil, or may be used in the form of an ointment (25 to 50 p.c.). 30 to 60 grains per day is regarded as the average dose of pure Iothion.

For the gradual application of Iodine, it appears (*B.M.J.E.* '05, ii. 23) to be of great value. It may be applied in the form of a 25 p.c. to 50 p.c. ointment made with Lanolin and Vaseline.

Prescribers should have their attention drawn to the fact that it possesses a sp. gr. of about 2½, and consequently the strength of preparations will vary greatly, according to whether it is dispensed by weight or by measure.

IPECACUANHÆ RADIX.

IPECACUANHA ROOT.

FR., IPÉCACUANHA ANNELÉ; GER., BRECHWURZEL; ITAL., IPECACUANA; SPAN., IPECACUANA.

The dried Root of *Psychotria Ipecacuanha.*

The description of the Root given in the *B.P.* excludes the Carthagena variety, the *U.S.P.* includes both Rio and Carthagena

Ipecacuanha, the *P.G.* only the Rio variety. The Root official in the *B.P.* is not required to yield any definite percentage of alkaloids, that of the *U.S.P.* must contain not less than 1·75 p.c. of Ipecacuanha alkaloids, whilst that official in the *P.G.* is required to indicate at least 2·0 p.c. of total alkaloids.

The *Brussels Conference* agreed that only the root bark should be powdered, rejecting the woody portion. The powder should have an alkaloidal strength of 2 p.c. In the Brazilian Ipecacuanha Root the proportions of Emetine to Cephaëline are as 75 to 25, in the Carthagena Root as 45 to 55.

Umney and Swinton record (*C.D.* '99, ii. 203, 226; *P.J.* '99, ii. 89, 114, 123), the results of an examination of Johor Ipecacuanha. The total alkaloids amounted to 1·7, of which 1·24 p.c. represented Emetine, 0·39 p.c. Cephaëline, and 0·07 p.c. Psychotrine, the percentage proportion being 72·94 to 22·94 to 4·12. The results point to the conclusion that so far as the relative proportions of alkaloids are concerned, this root is practically identical with the Brazilian, but it contains a lower percentage of total alkaloids than the average Brazilian roots unmixed with stems.

The relative percentage composition of the alkaloids from Brazilian and Columbian Ipecacuanha is given by Paul and Cownley (*A.J.P.* '01, 115) as follows:—Brazilian, Emetine 72·14, Cephaëline 25·87, Psychotrine 1·99. Columbian, Emetine 40·5, Cephaëline 56·8, Psychotrine 2·7. The paper gives an exhaustive *résumé* of the chemistry of Ipecacuanha.

The active principle resides in the bark; the inner or woody part contains but little.

From the experiments by Paul and Cownley (*P.J.* (3) xxiv. 61), it would appear (1) that the percentage of *total alkaloids* in Brazilian Ipecacuanha root does not vary much from 2 p.c. Rio Ipecacuanha Root contains the three alkaloids in the following proportions as compared with Carthagena and Indian Ipecacuanha:—

Brazilian (root)—Emetine 1·45 p.c., Cephaëline 0·52 p.c., Psychotrine 0·04 p.c. Total 2·01 p.c.

Brazilian (stem)—Emetine 1·18 p.c., Cephaëline 0·59 p.c., Psychotrine 0·03 p.c. Total 1·80 p.c.

Columbian—Emetine 0·89 p.c., Cephaëline 1·25 p.c., Psychotrine 0·06 p.c. Total 2·20 p.c.

Indian—Emetine 1·39 p.c., Cephaëline 0·5 p.c., Psychotrine 0·09 p.c. Total 1·98 p.c.—Paul and Cownley, *P.J.* '96, i. 321; '02, ii. 256.

In 1893 it was stated by Paul (*P.J.* (3) xxiv. 212) that from so-called de-emetinised Ipecacuanha he had obtained nearly 0·5 p.c. of the ordinary alkaloids of Ipecacuanha; but it can now be obtained entirely free from Emetine (**Pulvis Ipecacuanhæ sine Emetina**).

Medicinal Properties.—Expectorant, diaphoretic, gastro-intestinal stimulant, cholagogue. Emetic, slow in action (20 to 30 minutes), and depressant in large doses. Used in emetic doses in whooping-cough and croup to expel exudation or membrane as well as for its depressing effects on the circulation. Used as an expectorant in acute and chronic bronchitis when the phlegm is thick and scanty, and in winter-cough and phthisis. Given in gouty dyspepsia and biliousness. It relieves some forms of vomiting, such as that of pregnancy or alcoholism, when given in small doses, 1 or 2 minims of the **Vinum** every half-hour. Applied to the bites and stings of insects. The diaphoretic effect is best obtained when given in the form of the Compound Powder. In small doses it is commonly added to aperient pills for chronic constipation. A **spray** of the Wine of Ipecacuanha has been strongly recommended by Ringer and Murrell for chronic bronchitis and asthma. Had been abandoned in many parts of the world in treatment of dysentery, but Manson has reintroduced it, with certain important improvements, in chronic dysentery of the amœbic variety. Beginning with 30 grains, preceded by laudanum, and taken in diminishing dose every night for a week, is successful in most cases. For details *see L.* '07, ii. 1591.

In pneumonia.—*L.* '02, i. 183.

10 to 40 minims of the Wine three times a day in epilepsy.—*L.* '98, ii. 751; *P.J.* '99, i, 293.

Dose.—As an expectorant, $\frac{1}{4}$ to 2 grains = 0·016 to 0·13 gramme; as an emetic, 15 to 30 grains = 1 to 2 grammes.

Swiss, maximum single dose, 0·1 gramme = 1½ grains; maximum daily dose, 0·5 gramme = 7½ grains; maximum dose as an emetic, 5 grammes = 77 grains.

Prescribing Notes.—*Prescribed in small doses as an auxiliary in alterative pills. The compound powder is frequently given in the form of a* **powder, pill, cachet,** *or Compressed Tablet. A good* **pill** *can be made by using Dispensing Syrup, q.s. Children tolerate large doses well.*

Tablets of **Compound** Ipecacuanha Powder may be obtained containing $\frac{1}{2}$, 1, 2, 3 and 5 grains; of **Simple** Ipecacuanha, $\frac{1}{50}$, $\frac{1}{30}$, $\frac{1}{20}$, $\frac{1}{10}$, $\frac{1}{4}$ and 5 grains; **De-emetinised,** 5 grains; **Wine,** 1 and 5 minims; Ipecacuanha and Squill (*B.P.* pills), 4 and 5 grains.

Incompatibles.—Lead and Mercury salts, vegetable Acids, astringent Infusions.

Official Preparations.—Of the **Root,** Extractum Ipecacuanhæ Liquidum, Pulvis Ipecacuanhæ Compositus, Trochiscus Ipecacuanhæ, Trochiscus Morphinæ et Ipecacuanhæ; of the **Liquid Extract,** Acetum Ipecacuanhæ and Vinum Ipecacuanhæ; of the **Compound Powder,** Pilula Ipecacuanhæ cum Scilla.

Not Official.—Elixir Ipecacuanhæ, Extractum Ipecacuanhæ Liquidum Miscible, Glycerole of Ipecacuanha, Glycerinum Ipecacuanhæ, Linctus Ipecacuanhæ, Mistura Ipecacuanhæ Ammoniata, Mistura Ipecacuanhæ Salina, Mistura Ipecacuanhæ cum Soda, Oxymel Ipecacuanhæ, Pilula Ipecacuanhæ cum Urginea, Syrupus Ipecacuanhæ, Syrupus Ipecacuanhæ Aceticus, Tinctura Ipecacuanhæ, Tinctura Ipecacuanhæ et Opii, Emetine, Emetine Hydrobromide, Emetine Hydrochloride, Vinum Emetinæ, Vinum Emetinæ Cephaëline, Cephaëline Hydrochloride, Psychotrine.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Powder of Ipecacuanha in Austr., Belg., Dutch, Fr., Ger., Jap., Span., Swiss and U.S. contains 2 p.c. of alkaloids.

The *Brussels Conference* agreed that the powder should contain only the root-bark, rejecting the woody portion, also that the powder should have an alkaloidal strength of 2 p.c.

Descriptive Notes.—In the *B.P.* the name of the Ipecacuanha plant is given as *Psychotria Ipecacuanha*, Stokes; in the *P.G.* as *Uragoga Ipecacuanha*, Baill., and in the *U.S.P.* as *Cephaëlis Ipecacuanha*, A. Richard. The *P.B.* name is given on the ground that there is no good reason for separating the plant from the genus Psychotria. The *German* name is given apparently on a question of priority, if kept distinct from Psychotria. Carthagena Ipecacuanha, official in the *U.S.P.* is stated to be derived from *Cephaëlis acuminata*, Karsten.

The Ipecacuanha Root of commerce is imported under the name of Rio, Matto Grosso, or Minas Geraes Ipecacuanha, from Brazil, where it is indigenous; and under the name of Johor or Selangor Ipecacuanha from the Federated Malay States, where it is cultivated. Ipecacuanha imported from the United States of Columbia, and known as Carthagena Ipecacuanha, is official in the *U.S.P.* but not in the *P.B.* or *P.G.* These kinds may be distinguished as follows:—The Brazilian Ipecacuanha is usually of a rusty dull brown colour but varies somewhat in tint, for a good deal of the Root arrives in a mouldy state, and after being washed it assumes a blackish-brown colour. The Root is about $\frac{2}{10}$ inch in diameter, and annulated or ringed to the extent of about 20 rings to the inch, much broken and rarely branched. It is officially described as occurring in tortuous pieces, not often exceeding 6 inches (15 cm.) and $\frac{1}{4}$ inch (6 mm.) in thickness, of a dark brick-red to very dark brown colour. The Selangor Root is similar, but as a rule there are more slender rootlets present and the root is branched. The bark is thick in proportion to the woody centre, horny and whitish in fracture (resinous but sometimes starchy, *B.P.*), and forms about 75 to 80 p.c. of the Root. Carthagena Ipecacuanha is larger, of a paler and more distinctly reddish-brown tint, has more distant rings, which take the form of thinner merging ridges, and the fracture of the bark is greyish. Ipecacuanha Root varies much in quality, according to the amount of woody rhizome or stem present. The latter is smooth, slender, and cylindrical, with a very thin bark, and as the active principles are chiefly contained in the bark, only a very small quantity (about 5 p.c. of the amount present) being contained in the woody centre, the medicinal value of the Root is less in direct proportion to the amount of stem present. Brazilian and Selangor Ipecacuanha contain more Emetine than Cephaëline; Carthagena Ipecacuanha contains more Cephaëline than Emetine.

In powder, Ipecacuanha is distinguished by the absence of vessels, sclerenchyma and bast fibres, and the presence of tracheids, porous parenchymatous cells and acicular raphides, and by starch grains which do not exceed 0·012 mm. (*P.G.*) and occur in groups of 3 to 5 grains. Several other roots have been offered as substitutes for Ipecacuanha, the histological distinctions of which are given in the *Pharm. Jour.* (3) xxxiv. 210. Powdered Ipecacuanha Root has been found adulterated with almond meal, which may be recognised by the presence of the granular albuminous matter, some of which exhibits a crystalloid aspect as seen under polarised light.

Tests.—Numerous methods have been suggested for the determination of the alkaloids in Ipecacuanha Root. The most complete research upon the chemistry of the alkaloids is undoubtedly that of Paul and Cownley. The method suggested by them (*A.J.P.*

'01, 116) is as follows:— A weighed quantity of 50 grammes of the Root is mixed with one-fifth of its weight of Lime moistened with Water and extracted with Amyl Alcohol. The Amyl Alcohol solution is extracted with dilute acid, and the acid liquid shaken with Ether and Ammonia Solution to remove the Emetine and Cephaëline, leaving the Psychotrine to be extracted from the ammoniacal liquid by Chloroform. The Ether residue is titrated with Semi-normal Volumetric Hydrochloric Acid Solution, 1 c.c of the Volumetric Acid Solution representing 0·123175 gramme of Emetine and 0·11622 gramme of Cephaëline. A separation of the Emetine and Cephaëline is then effected by treating the Hydrochloric Acid solution with Sodium Hydroxide in the presence of Ether and repeatedly shaking the ethereal solution with Sodium Hydroxide Solution until all the Cephaëline has been separated. The Ether solution of the Emetine is evaporated and the residue titrated with standard acid, the result being expressed as Emetine. The Sodium Hydroxide liquor is acidified, rendered alkaline with Ammonia Solution and shaken with Ether, the Ether residue of Cephaëline being titrated with Semi-normal Volumetric Acid Solution. The sum of the number of c.c. of Semi-normal Volumetric Hydrochloric Acid used in titrating the separated bases should equal the number required before their separation.

When a determination of the total alkaloidal content of a root alone is necessary, several good processes are available. That devised by Bird may be carried out fairly rapidly, and has the advantage that the difference between the gravimetric and the volumetric determinations is reduced to a minimum. A weighed quantity of 10 grammes of the Ipecacuanha Root in fine powder is mixed with 1 gramme of Sodium Bicarbonate, and is then rubbed to a uniform moist granular powder with another 1 gramme of Sodium Bicarbonate shaken with 5 c.c. of Water. The moistened powder is then added to 20 c.c. of a mixture of 1 volume of Amyl Alcohol, 1 volume of Chloroform, and 3 volumes of Ether, contained in a separator, the stem of which is plugged with a pledget of cotton-wool, and the neck of which can be connected with a pressure bellows. The maceration is allowed to proceed for half an hour, with occasional shaking. The liquid is forced out of the separator by the pressure bellows, and the powder is again extracted with 10 c.c. of the same menstruum. After a vigorous agitation it is allowed to stand for 15 minutes, the liquid is again forced out with pressure bellows. The exhaustion is repeated ten or a dozen times at 15 minutes' intervals, with successive quantities of the same menstruum, or until the powder is exhausted. The ethereal liquids are mixed and extracted successively, first, with 10 c.c. of a mixture of 4 c.c. of Volumetric Sulphuric Acid Solution, and then with three successive quantities, each of 5 c.c. of Water, the aqueous layers being separated in each instance. The acid and aqueous solutions are mixed, rendered alkaline by the addition of 0·5 gramme of Ammonium Bicarbonate, and the liberated alkaloids are shaken out, first with 20 c.c., subsequently with two successive quantities, each of 10 c.c. of Chloroform, containing one-sixth its volume of Ether, and lastly with 10 c.c. of the same mixture plus 1 drop of Strong Ammonia Solution, the chloroformic solution being separated in each case; they are mixed and shaken with a saturated Sodium Chloride Solution containing 1 drop of Strong Ammonia Solution. The perfectly clear chloroformic solution is separated by forcing it through a very small plug of cotton-wool previously saturated with Chloroform and placed in the neck of the separator; the brine is washed by rotating it with a few c.c. more Chloroform mixture, the Chloroform solution separated, mixed with the first chloroformic solution, evaporated to about 1 or 2 c.c., 5 c.c. of Ether sp. gr. 0·717 added, and the evaporation continued, allowing the residue to form a thin film on the inner surface of the vessel. Dry below 80° C. (170° F.) and weigh. The residue is dissolved in a neutral mixture of 10 c.c. Amyl Alcohol, 10 c.c. of Ether sp. gr. 0·717, and 5 c.c. of a saturated Sodium Chloride Solution, and titrated with Tenth-normal Volumetric Sulphuric or Hydrochloric Acid Solution, using Methyl Orange Solution as an indicator of neutrality. 1 c.c. of Tenth-normal Volumetric Acid Solution may be taken as representing 0·024287 gramme of alkaloids. The factor 0·024287 is based upon the percentage composition of Rio Ipecacuanha Root recorded in the researches of Paul and Cownley, viz., practically 3 equivalents of Emetine to 1 of Cephaëline, using *B.P.* atomic weights. Where only approximate or comparative results are required, the following modification of the above process may be adopted:—A weighed quantity of 12 grammes of the finely-powdered Root is mixed with 1 gramme of Sodium Bicarbonate, rubbed in a small mortar to a uniform moist granular powder with 1·4 gramme of Sodium Bicarbonate, shaken with 6 c.c. of Water, and added to 120 c.c. of a mixture of 1 volume of Amyl Alcohol, 1 volume of Chloroform, and 3 volumes of Ether, contained in a similarly-fitted separator to that used in the previous determination. The mixture is shaken occasionally during 2 or 3 hours, 5 c.c. of brine added, agitated, and after aggregation of the powder 100 c.c. of the clear liquid, representing 10 grammes of the Root, is forced out by means of the pressure bellows into a graduated 100 c.c. flask. The alkaloids are then extracted by shaking with the acid mixture, and the process continued on the lines indicated above.

The method of determination adopted by the *U.S.P.* is essential as follows:—A weighed quantity of 15 grammes of the Root in No. 80 powder is shaken for 5 minutes in an Erlenmeyer flask, with a mixture of 115 c.c. of Ether and 35 c.c. of Chloroform, and, after the addition of 3 c.c. of Ammonia Water, is again shaken at intervals during half an hour. 10 c.c. of Water is added, and the liquid shaken until the powder agglomerates, when a measured quantity of 100 c.c. of the clear ethereal solution is transferred to a separator and the alkaloids extracted by shaking moderately for 2 minutes with a mixture of 10 c.c. of Normal Volumetric Sulphuric Acid Solution and 10 c.c. of Water. The acid aqueous liquid is separated, transferred to a second separator, and the extraction of the ethereal solution repeated, first with a mixture of 3 c.c. of Normal Volumetric Sulphuric Acid Solution and 5 c.c. of Water, and then with 10 c.c. of Water, the acid aqueous and the aqueous shakings being in each case separated and transferred to the second separator. The mixed liquids in the second separator are now rendered alkaline by the addition of a sufficiency of Ammonia Water, and the alkaloids extracted by shaking for 1 minute, first with 25 c.c., then with 20 c.c., and lastly with 10 c.c. of Ether, separating the ethereal liquids in each case from the lower alkaline aqueous portion and transferring the ethereal solutions to a tared flask. The Ether is distilled off on a water-bath, and the residue is dissolved by gently warming it on a water-bath with 12 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution, the excess of Volumetric Acid Solution being titrated with Fiftieth-normal Volumetric Potassium Hydroxide Solution, 5 drops of Cochineal Test Solution being used as an indicator of neutrality. The number of c.c. of Fiftieth-normal Volumetric Alkali Solution used is divided by 5, the quotient subtracted from 12, and the difference multiplied first by 0·0238, and then by 10, the result being the percentage w/w of Ipecacuanha alkaloids present in the sample. It will be noticed that the factor employed by the *U.S.P.* in calculating the result of the Volumetric Test represents the mean combining weights of Emetine and Cephaëline. The choice of Ether as a solvent is open to question. Bird has shown that Ether alone is not entirely satisfactory as a solvent, as it is very difficult to remove the last traces of alkaloid from an alkaline solution by this reagent. Psychotrine is, moreover, according to Paul and Cownley, not extracted by Ether. The *P.G.* employs a mixture of 3 parts by weight of Ether and 1 part by weight of Chloroform for the extraction of the alkaloids, the method of determination being also a volumetric one. Sodium Hydroxide Solution (15 p.c.) is employed to liberate the alkaloids from their combinations. Upon the solubility of Cephaëline in Sodium Hydroxide Solution is based the method for its separation from Emetine, and its incomplete extraction by the Ether-Chloroform solvent therefore renders the results obtained by the process below the truth. The method of determination is briefly as follows:—A weighed quantity of 12 grammes of the Root in fine powder dried at 100° C. (212° F.) is mixed in a well-stoppered bottle with 90 grammes of Ether and 30 grammes of Chloroform, and, after being well shaken 10 c.c. of a mixture of 2 parts by weight of Sodium Hydroxide Solution (15 p.c.) and 1 part by weight of Water is added, and the whole allowed to stand for 3 hours, with frequent intervals of vigorous shaking. 10 c.c. or sufficient Water to cause the powdered Root to agglomerate and the Ether-Chloroform solution to separate to a clear liquid is added, and, after being allowed to stand for 1 hour, a measured quantity of 100 grammes of the clear Ether-Chloroform solution is filtered through a dry, well-covered filter into a flask, and about one-half of the liquid is distilled. The residual liquid in the flask is transferred to a separator, the flask washed with three successive quantities, each of 5 c.c. of Ether, and the alkaloids thoroughly extracted with 12 c.c. of Tenth-normal Volumetric Hydrochloric Acid Solution. When the liquids have completely and clearly separated, and after the addition of sufficient Ether to cause the Ether-Chloroform solution to float on the surface of the acid liquid, the latter is filtered through a small filter paper moistened with Water into a flask of 100 c.c. capacity. The Ether-Chloroform solution is shaken with three successive quantities, each of 10 c.c. of Water, which are separated and filtered through the same filter, the latter is washed with Water, and the mixed liquids are diluted with Water to 100 c.c. A measured quantity of 50 c.c. is transferred to a white glass-stoppered flask, having a capacity of 200 c.c., mixed with 50 c.c. of Water and sufficient Ether to form a layer of about 1 cm. After the addition of 5 drops of a 1 in 500 solution of Iodeosin in Alcohol (90 p.c.), sufficient Hundredth-normal Volumetric Potassium Hydroxide Solution is added to cause the lower aqueous layer to assume a pale rose-red tint; not more than 20 c.c. of the Hundredth-normal Volumetric Solution should be necessary. The number of c.c. of Hundredth-normal Volumetric Potassium Hydroxide used, divided by 10, the quotient multiplied by 2, the product subtracted from 12, and the remainder, multiplied first by 0·024475, and then by 10, gives the percentage of Ipecacuanha alkaloids present in the sample, using the *German* atomic weights, and the proportions of 3 of Emetine and 1 of Cephaëline. If the mean molecular weights of Emetine and Cephaëline are employed, the factor is 0·024125. No factor is given in the *P.G.*, but if the *P.G.* official limit is calculated with the factor 0·024475, it represents not less than 1·96 p.c. In the process given by Keller, Ammonia Solution is employed for the liberation of the alkaloid, consequently there is not the same liability to the retention of Cephaëline. The detail of the method is as follows:—A weighed quantity of 12 grammes of the powdered Root is shaken in a glass-stoppered bottle with 90 grammes of Ether and 30 grammes of Chloroform. After an interval, 10 c.c. of Ammonia Solution is added, the mixture shaken at intervals for half an hour, and, after the addition of 10 c.c. of Water, it is again shaken for a short time until the powder agglomerates. The clear Ether-Chloroform solution is filtered through a small filter paper, which has been moistened with Ether, and a weighed quantity of 100 grammes is introduced into a separator and shaken with three successive quantities, each of 25, 15, and 10 c.c. of a 1 p.c. Hydrochloric Acid Solution, the shakings being repeated if necessary so long as a few drops of the acid shakings yield a precipitate with Potassio-Mercuric Iodide (Mayer's) Solution. The acid aqueous solutions are separated, mixed, transferred to a separator, made alkaline with Ammonia Solution, and shaken with three successive quantities, each of 50, 30, and 20 c.c., of a mixture of 2 parts by weight of Ether to 3 parts by weight of Chloroform. The Ether-Chloroform solutions are separated in each case, mixed, filtered through a small filter paper moistened with Ether, into a tared flask, the Ether-Chloroform distilled, the residue dried on the water-bath till constant in weight, cooled and weighed. In the event of the titration of the alkaloidal residue being required, it may be dissolved in 5 c.c. of neutral Alcohol (90 p.c.), Water added until the liquid becomes faintly opalescent, and the titration effected with Tenth-normal Volumetric Hydrochloric Acid Solution, using Hæmatoxylin Solution (1 in 500 of Alcohol, 90 p.c.)

as an indicator. Keller states that each c.c. of Volumetric Acid is equivalent to 0·0254 gramme of alkaloids, which agrees with the $C_{30}H_{40}N_2O_5,2HCl$ formula of neutral Emetine Hydrochloride. If the 3:1 ratio of Emetine to Cephaëline factor is used, each c.c. of Tenth-normal Volumetric Acid will be equivalent to 0·024287 gramme of Ipecacuanha alkaloids.

Allen has studied the comparative colour reactions of the Ipecacuanha alkaloids and the Opium alkaloids (*see* also Tinctura Camphoræ Composita), and the results of his experiments are recorded (*Analyst*, '02, 349). The colour tests were made by taking up the alkaloidal solution in a pipette and allowing it to fall drop by drop on to the concave side of a porcelain crucible lid placed on a flask full of boiling Water. To the spot of alkaloidal residue thus obtained a drop of reagent was added by means of a glass rod, and the mixture cautiously stirred. With Ferric Chloride the Ipecacuanha alkaloids gave a blue coloration changing to green, as against a greenish-blue from a residue of Opium alkaloids; Sulphuric Acid containing 0·5 p.c. of Molybdic Acid (Frohde's reagent) gave colours varying from bluish-purple to violet, the colour resembling that given by Opium alkaloids, but not so bright as that yielded by pure Morphine; Starch and Iodic Acid gave, with some specimens of alkaloidal residue, an immediate blue coloration, but a negative or tardy result in other cases; Opium alkaloids gave an immediate blue colour; with Ferric Chloride and Potassium Ferricyanide, both the Ipecacuanha alkaloids and the Opium alkaloids gave an immediate Prussian blue coloration. In some cases the alkaloidal residues were purified by treatment with Lead Acetate. The isolated and purified alkaloids in some instances gave reactions less striking than those obtained with the mixed alkaloidal residue.

For a valuable means of detecting Ipecacuanha alkaloids, *see* Psychotrine, p. 693.

A determination of the total ash of powdered Ipecacuanha is stated (*Proc. Amer. Jour. Pharm.* 51, 771; *P.J.* '03, i. 387) to afford but little clue to the nature of the drug powdered. The presence of more than 1 p.c. of sand generally indicates a dusty or otherwise objectionable root.

Preparations.

ACETUM IPECACUANHÆ. VINEGAR OF IPECACUANHA.

Liquid Extract of Ipecacuanha, 1; Alcohol (90 p.c.); 2; Diluted Acetic Acid, *q.s.* to make 20. (1 in 20)

Dose.—10 to 30 minims = 0·6 to 1·8 c.c.

Tests.—Vinegar of Ipecacuanha has a sp. gr. of about 0·990; contains about 0·75 p.c. w/v of total solids, about 12·0 p.c. w/v of Absolute Alcohol, and about 3·57 p.c. w/v of absolute Acetic Acid. A measured quantity of 10 c.c. requires about 6 c.c. of Normal Volumetric Sodium Hydroxide Solution for neutralisation, Phenolphthalein Solution being employed as an indicator of neutrality; this corresponding to about 3·57 p.c. w/v of absolute Acetic Acid. It is prepared with the official Fluid Extract, which is required to contain not less than 2 and not more than 2·25 p.c. w/v of alkaloids; the Vinegar should therefore contain not less than 0·10 p.c. w/v nor more than 0·112 p.c. w/v. No official method of determination is given, but a convenient process has been suggested by Bird. A measured quantity of 100 c.c. is nearly neutralised with Potassium Hydroxide Solution, 2·5 c.c. of Lead Subacetate Solution added, and a few grains of washed Asbestos powder. The mixture is heated on the water-bath until a distinct separation of the precipitate is observed, transferred to a Buchner filter, and filtered under pressure. The nearly dry solid cake remaining on the filter is washed with 30 c.c. of Water, added in small portions at a time, the filtrate and washings are mixed with 25 c.c. of diluted Sulphuric Acid, and the precipitated Lead Sulphate separated by again filtering through a Buchner's filter, and washed with 15 c.c. of Water. 25 c.c. of Chloroform is added to the mixed filtrate and washings, and Ammonia Solution in excess. The flask is corked, agitated vigorously, and the contents transferred to a separator, which is plugged at the neck with a pledget of Cotton-Wool. The chloroformic solution and a portion of the aqueous liquid is forced out of the first separator into a second separator, by means of a pressure ball attached to the former, and the clear chloroformic liquid is separated and transferred to a tared basin or flask. The chloroformic extraction is repeated with four successive quantities, each of 25 c.c. of Chloroform, the aqueous liquid in the second separator being in each instance returned to the first separator previous to the addition of the Chloroform. The mixed chloroformic solutions are evaporated to dryness on a water-bath, the residue dried at a temperature below 80° C. (176° F.) and weighed.

EXTRACTUM IPECACUANHÆ LIQUIDUM. Liquid Extract of Ipecacuanha.

A Liquid Extract standardised to contain 2 to 2¼ grains of Ipecacuanha alkaloids in 110 minims (2 to 2·25 grammes in 100 c.c.); prepared with Ipecacuanha Root, Calcium Hydroxide, and Alcohol (90 p.c.).

Dose.—As an expectorant, ½ to 2 minims = 0·03 to 0·12 c.c.; as an emetic, 15 to 20 minims = 0·9 to 1·2 c.c.

Swiss, maximum single dose, 0·05 gramme; maximum daily dose, 0·25 gramme.

Foreign Pharmacopœias.—Official in Dan., Swed., Swiss, and U.S., 1 in 1. Belg. (Ipecacuanha Extractum Fluidum Compositum) 3 of Tincture in 10. Fr., Mex. and Span. have solid extract. Swiss contains at least 2 p.c. of alkaloids and U.S. 1·75 p.c.

Tests.—Liquid Extract of Ipecacuanha has a sp. gr. of 0·885 to 0·910; contains from 6 to 12 p.c. w/v of total solids and about 78 p.c. w/v of Absolute Alcohol. The Fluid Extract official in the *B.P.* is required to contain not less than 2·0 p.c. w/v and not more than 2·25 p.c. w/v of alkaloids. The *B.P.* states 'alkaloid,' but, inasmuch as it refers immediately above to 'alkaloids,' this may be taken as a printer's error. The essential features of the official method of assay are as follows:—A measured quantity of 20 c.c. of the Fluid Extract is mixed with 20 c.c. of Water and evaporated on a water-bath until the Alcohol is dissipated. The warm solution is precipitated with Lead Subacetate Solution, and is preferably allowed to remain on the water-bath until the precipitate becomes granular and commences to subside. It is then filtered off, washed with Water, and to the filtrate and washings sufficient Sulphuric Acid is added to precipitate the excess of Lead Subacetate. The precipitate is filtered off, washed with Water, and the mixed filtrate and washings are transferred to a separator. Sufficient Ammonia Solution to form an excess is added, and the liberated alkaloids are extracted by shaking with three successive quantities each of 25 c.c. of Chloroform. The chloroformic layers are removed in each case, mixed, transferred to a tared flask, evaporated on a water-bath, and the residue dried at a temperature below 80° C. (176° F.) till constant in weight, and weighed. This weight multiplied by 5 yields the p.c. w/v of total alkaloids present in the sample. This process has been subjected to severer and more adverse criticism than almost any other assay process in the British Pharmacopœia. The quantity of the Liquid Extract taken for the determination is too large and too wasteful of material. The Lead precipitate is bulky and unmanageable. Its nature renders the washing with Water a lengthy and troublesome operation. The chloroformic liquids have a tendency to obstinately emulsify, and they require a considerable time to separate, and over and above the inaccuracy due to the consequent unavoidable loss of alkaloid is the fact that the alkaloidal residue, when it is finally obtained, is impure.

Several processes of determination have been suggested with a view to devising an expeditious, accurate and readily-conducted method. The process devised by Wilson gives more accurate results than the *B.P.* method, and can, moreover, be almost completed whilst the first *B.P.* Lead precipitate is being filtered and washed. The method has been in general use in the author's laboratory, and has been found expeditious and accurate. Liquid Extracts which contain an exceptional amount of resinous substances are not suitable for assay by this process. In carrying out the process a measured quantity of 20 c.c. of the Liquid Extract is placed in a porcelain basin, diluted with 20 c.c. of Water, evaporated to somewhat less than half its bulk, and allowed to cool. It is mixed with 1 c.c. of dilute Sulphuric Acid, transferred to a separator, the dish washed with 20 c.c. of Water and the mixed liquids shaken with 10 c.c. of a mixture of equal parts of Chloroform and Ether, separation being promoted by gently warming; the Ether-Chloroform layer is separated and the shaking repeated with two successive quantities each of 10 c.c. of a similar mixture, the Ether-Chloroform layers being in each case separated and rejected. An excess of Ammonia Solution is now added and the liberated alkaloids are removed by agitation with 10 c.c. of Ether-Chloroform (equal volumes), the mixture warmed to promote separation, the Ether-Chloroform layer separated, and transferred to a tared flask. The extraction with Ether-Chloroform is repeated with two successive portions each of 10 c.c. of the Ether-Chloroform, the Ether-Chloroform layers being separated in each case as previously, and transferred to the tared flask. The Ether-Chloroform is removed by distillation, the residue is dried at a temperature below 80° C. (176° F.) until constant in weight, cooled and weighed. It may then be dissolved in a measured quantity of Tenth-normal Volumetric Hydrochloric Acid Solution and the excess of acid titrated with Tenth-normal Volumetric Sodium Hydroxide Solution, using a few drops of a 1 in 500 Iodeosin Solution in Alcohol (90 p.c.) as an indicator of neutrality. The factor to be used in calculating the result of the volumetric determination is discussed under the tests for Ipecacuanha Root. Naylor, in his Presidential address to the British Pharmaceutical Conference on the Standardisation of Galenicals, claims that the process detailed by Naylor and Bryant (*Y.B.P.* '99, 345) and that of Farr and Wright (*Y.B.P.* '99, 340) are the only published methods of assay which in his hands have yielded uniformly accurate results with every type of Liquid Extract. The process which is described in the *Y.B.P.* '99, 345, consists in warming a measured quantity of 10 c.c. of the Liquid Extract in a basin over a water-bath until the Alcohol is dissipated. The residue is transferred to a 50 c.c. flask, the basin rinsed out with successive portions of a mixture of 2 c.c. of Diluted Sulphuric Acid and 30 c.c. of Water. The solution is filtered, and the filter washed with Water until the volume of the filtrate amounts to 50 c.c. A measured quantity of 25 c.c. (= 5 c.c. of the Liquid Extract) is transferred to a separator, the measure washed with Water, and the mixed liquids are shaken with 10 c.c. of Chloroform. The Chloroform layer is separated and rejected, the shaking being repeated with a further quantity of 10 c.c. of Chloroform, and the chloroformic layer again separated and rejected. The aqueous portion is then rendered alkaline with Ammonia Solution and the liberated alkaloids extracted by agitation with three successive quantities each of 10 c.c. of Chloroform. The chloroformic layer is in each case separated, transferred to a tared flask, the mixed chloroformic solutions evaporated to dryness, the residue dried till constant in weight, cooled and weighed. It may then be dissolved in a measured quantity of Tenth-normal Volumetric Hydrochloric Acid Solution and the excess of Volumetric Acid titrated as described above.

Bird is rightly of opinion that whatever the inaccuracies and imperfections of the Pharmacopœia process, the fact remains that it is the standard by which the Liquid Extract must be tested and judged, and in the event of another process being selected it is absolutely essential that the results obtained shall bear a constant relation to the result given by the *B.P.* method and be capable of accurate translation into the official figures. He has devised a process, the details of which are claimed to be quite in accordance with a close interpretation of the *B.P.* A measured quantity of 20 c.c. of the Liquid Extract is mixed with 20 c.c. of Distilled Water and a sufficient quantity of Acetic Acid to ensure a faintly acid reaction. The Alcohol is evaporated off, and 20 c.c. of Water and 10 c.c. of Liquor Plumbi Subacetatis added. The mixture is allowed to remain on the water-bath until the magma which first forms changes to a thin liquid, and the precipitate assumes a finely granular condition. It is then transferred to a Buchner's funnel and filtered under pressure. The nearly dry solid cake remaining on the filter is washed with 30 c.c. of water added in successive small portions; 25 c.c. of diluted Sulphuric Acid is added to the filtrate and washings, and the precipitated Lead Sulphate removed by filtration on the Buchner's filter under pressure. The cake of Lead Sulphate is washed with 15 c.c. of Water, and to the filtrate and washings 5 c.c. of Chloroform and an excess of Ammonia Solution are added. The flask is cooled, the whole vigorously shaken, and the contents transferred to a separator, the neck of which is plugged with a pledget of Cotton-Wool, and the orifice of which is fitted with a cork and rubber bellows. The Chloroform layer and a portion of the aqueous layer is then forced out of the first separator into a second separator, from which the clear chloroformic layer is drawn off into a tared flask. The aqueous portion of the liquid in the second separator is transferred to the first separator, and the contents of the latter are shaken with two successive quantities, each of 25 c.c. of Chloroform, the chloroformic layers in each case being removed and transferred to the tared flask. The Chloroform is evaporated on a water-bath, the residue dried below 80° C. (176° C.) till constant. The alkaloidal residue is then dissolved in a neutral mixture of 10 c.c. Amyl Alcohol, 10 c.c. of Ether, and 5 c.c. of a saturated Sodium Chloride Solution, and titrated with Tenth-normal Volumetric Acid Solution, using Methyl Orange or Hæmatoxylin Solution as the indicator. The same factor as above mentioned may be employed in calculating the result of the volumetric determination.

The standard originally given for the Root was not less than 2 p.c. of Ipecacuanha alkaloids, whilst that for the Fluid Extract was 1·75 p.c. w/v; the present standard for the Root is 1·75 p.c., for the Fluidextractum 1·5 p.c.

The method adopted by the *U.S.P.* for the determination of the alkaloids is a volumetric one, the essential details being as follows:—The Alcohol is removed from a measured quantity of 10 c.c. of the Fluid Extract by evaporation in a porcelain evaporating basin on a water-bath, 5 c.c. of Normal Volumetric Sulphuric Acid Solution and 20 c.c. of Water being added when almost cool, and the liquid stirred intermittently for 3 minutes. It is filtered into a separator, the dish and filter paper are washed with successive quantities of 10 c.c. and 5 c.c. of Water, the filtrate and washings are rendered alkaline with Ammonia Solution and shaken for 1 minute with 20 c.c. of Ether. The aqueous layer is separated and the extraction of the alkaloids repeated with two successive quantities each of 10 c.c. of Ether, the ethereal solutions being in each case separated and added to the first ethereal solution. The Ether is evaporated at a gentle heat from the mixed ethereal liquids and the alkaloidal residue is dissolved in 10 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution. When completely dissolved 5 drops of Cochineal Solution are added, and the excess of Volumetric Acid Solution is titrated with Fiftieth-normal Volumetric Potassium Hydroxide Solution. The number of c.c.

required is divided by 5, the quotient subtracted from 10, the remainder multiplied first by 0·0238, and then by 10, yields the percentage w/v of Ipecacuanha alkaloids present in the sample. The process has been tried in the author's laboratory, and works very satisfactorily. The separations are clean and sharp, the extracted alkaloids are of good colour, and in the volumetric determination no difficulty exists in determining the end-reaction. Ether being employed as a solvent, the residue consists naturally of Ether-soluble alkaloids only, Psychotrine being insoluble in Ether is not determined. In the case of an official preparation of Rio Ipecacuanha, according to Paul and Cownley the Psychotrine is hardly worth consideration. The process being a volumetric one yields lower results than are obtained by a gravimetric process, but returns the true alkaloidal percentage and not a percentage of alkaloids plus an indefinite amount of inert matter. A sample of *B.P.* Liquid Extract which yielded when examined by the *B.P.* process 2·0 p.c. w/v of total alkaloids, yielded when examined by the *U.S.P.* process 1·67 p.c. w/v of the alkaloids of Ipecacuanha.

The use of Ether, first, in a well-diluted decidedly-acid solution of the Liquid Extract, and then in ammoniacal solution, was suggested by Paul and Cownley, *Y.B.P.* '03, 100.

The Liquid Extract has been stated to deteriorate rapidly in alkaloidal content on keeping. Specimens of Liquid Extract prepared with both Rio and Carthagena Root are stated (*P.J.* '99, ii. 622) to have deteriorated in two months from 2·08 p.c. to 1·528 p.c., indicating a loss of 26·53 p.c. in the case of the Liquid Extract made from the Rio Root, and from 2·1 p.c. to 1·525 p.c. in the case of the Liquid Extract made from the Carthagena Root; the Wine made from the Rio Root from 0·10 p.c. to 0·025 p.c. Deterioration is also stated (*P.J.* '00, i. 8.) to take place in the alkaloidal value of the Liquid Extract and more rapidly in the case of the Wine. On the contrary, it has been stated (*P.J.* '99, ii. 633; '00, i. 54) that there is no reason for such depreciation, and it is shown that samples examined after the lapse of considerable intervals of time showed no depreciation in alkaloidal value. Such a marked depreciation as 26·53 p.c. in alkaloidal strength in two months is regarded (*P.J.* '00, i. 414) as still awaiting explanation, but will probably be found due to the presence of much free alkaloid in alkaline or insufficiently acid solution. From the result of an examination of samples of the Liquid Extract (*C.D.* '02, ii. 290; *P.J.* '02, ii. 134) it appears that the total amount of alkaloids lost during nine months amounted to 5·66 p.c., so that although a depreciation occurs, the amount is very small. The indications are distinctly in favour of loss of alkaloid by precipitation as opposed to loss of alkaloid by decomposition.

PILULA IPECACUANHÆ CUM SCILLA. PILL OF IPECACUANHA WITH SQUILL.

Compound Powder of Ipecacuanha, 3; Squill, in powder, 1; Ammoniacum, in powder, 1; Syrup of Glucose, *q.s.*

(about 1 of Opium in 20)

Dose.—4 to 8 grains = 0·26 to 0·52 gramme.

Foreign Pharmacopœias.—Official in Port., similar to Brit. Not in the others.

A corresponding preparation, Pilula Ipecacuanhæ cum Urginea, is Official in the *Ind.* and *Coll. Add.*, for India and the Eastern Colonies.

PULVIS IPECACUANHÆ COMPOSITUS. Compound Powder of Ipecacuanha. *B.P.Syn.*—Dover's Powder.

Ipecacuanha Root, 1; Opium, 1; Potassium Sulphate, 8. All in powder. (1 Opium, 1 Ipecac. in 10)

Medicinal Properties.—An admirable diaphoretic and anodyne; it is also most useful in gastric ulceration, dyspeptic vomiting, dysentery and diarrhœa; in the latter case it is combined with Calomel. In doses of 3 or 4 grains it will often relieve heartburn.

Dose.—5 to 15 grains = 0·3 to 1 gramme.

Ph. Ger. maximum single dose, 1·5 grammes; maximum daily dose, 5·0 grammes.

Foreign Pharmacopœias.—Official in all, and is the well-known Dover's Powder; Austr., Belg., Ger., Norw., Russ., Swed. and Swiss (Pulvis Ipecacuanhæ Opiatus); Hung. (Pulvis Doveri); Dan. (Pulv. Ipecac. Thebaicus); Dutch (Pulvis Opii Compositus); Fr. (Poudre d'Ipecacuanha Opiacée); Port. (Po de Ipecacuanha Composto); Jap. (Pulvis Doveri); and U.S. (Pulvis Ipecacuanhæ et Opii), with Milk Sugar; all same strength as Brit.; Span. (Polvo de Ipecacuana Opiado), 1 Opium, 1 Ipecacuanha, in 10; Ital. (Polvere del Dower), Opium 1, Ipecacuanha 1, Liquorice Powder 1, Nitre 2, Potassium Sulphate 2; Mex. (Polvo de Dower), Opium 1, Ipecacuanha 1, Nitre 4, Potassium Sulphate 4.

The *Brussels Conference* agreed for it to contain 10 p.c. of Pulvis Opii.

The original Powder of Dr. Dover was prepared by fusing together 4 parts of Potassium Nitrate with 4 of Potassium Sulphate, and reducing the product to fine powder; to this was added 1 of Ipecacuanha, 1 of Opium and 1 of Liquorice.

TROCHISCUS IPECACUANHÆ. Ipecacuanha Lozenge.

$\frac{1}{4}$ grain of Ipecacuanha in each, with Fruit Basis.

Dose.—1 to 3 lozenges.

Foreign Pharmacopœias.—Official in Austr., Belg. (Tabellæ), Dutch, Fr., Jap., Mex., Port., Russ. and Swiss, 0·01 gramme = about $\frac{1}{6}$ grain; Ital., 0·015 gramme = about $\frac{1}{4}$ grain. Not in the others.

TROCHISCUS MORPHINÆ ET IPECACUANHÆ. See p. 787.

VINUM IPECACUANHÆ. Ipecacuanha Wine.

Liquid Extract of Ipecacuanha, 1; Sherry, 19. (1 in 20)

Dose.—As an expectorant, 10 to 30 minims = 0·6 to 1·8 c.c.; as an emetic, 4 to 6 fl. drm. = 14·2 to 21·4 c.c.

Foreign Pharmacopœias.—Official in Swed., Fluid Extract 1, Marsala 10; U.S., Fluid Extract 1, Alcohol (95 p.c.) 1, White Wine 8; Dutch, Ipecacuanha 1, Diluted Spirit 1, Malaga 9; Ger., Jap., Norw. and Russ., 1 of Ipecacuanha and 10 of Sherry; Port., 1 of Ipecacuanha in 20 of Port. Not in the others.

Tests.—Ipecacuanha Wine has a sp. gr. of 0·985 to 1·000; contains about 5 p.c. w/v of total solids and about 20 p.c. w/v of Absolute Alcohol. It is prepared with the official Liquid Extract, which is required to contain not less than 2·0 p.c. w/v nor more than 2·25 p.c. w/v of total alkaloids. The Wine should, therefore, contain not less than 0·1 p.c. w/v nor more than 0·1125 p.c. w/v of total alkaloids. No official method is given for the determination of the alkaloids. A convenient method is that suggested by Bird. A measured quantity of the Wine is mixed with 2·5 c.c. of Lead Subacetate Solution and a few grains of washed asbestos powder. The mixture is heated on a water-bath until a distinct separation of the precipitate occurs and is then filtered under pressure on a Buchner's filter, the process being completed as described in Bird's process for the assay of the Liquid Extract (*Y.B.P.* '99, 347).

The following process has been suggested by Naylor and Bryant:— A measured quantity of 100 c.c is evaporated to one-tenth its volume, a little Kieselguhr stirred in, the mixture transferred to a beaker, and the basin washed with a mixture of 2 c.c. of diluted Sulphuric Acid and 30 c.c. of Water. The solution is then filtered, and Water passed through the filter until the volume measures 50 c.c. A measured quantity of 25 c.c. of the filtrate (=50 c.c. of the Wine) is transferred to a separator and treated as described in Naylor's method for the assay of the Liquid Extract.

Not Official.

ELIXIR IPECACUANHÆ.—Liquid Extract of Ipecacuanha, 1; Rectified Spirit, 1; Simple Elixir, 1; Glycerin, 5; Water, *q.s.* to produce 20.—*Pharm. Form.*

This has been incorporated in the *B.P.C.*

EXTRACTUM IPECACUANHÆ LIQUIDUM (MISCIBILE).—Liquid Extract of Ipecacuanha, *B.P.*, 100; Distilled Water, *q.s.* to produce 100 of finished product; Acetic Acid *q.s.*

Mix the Liquid Extract of Ipecacuanha with 100 of Distilled Water, allow to stand in a cool place for 24 hours, filter, washing the residue on the filter paper until colourless, keeping the washings separate, acidify the filtrate with Acetic Acid to a slight acid reaction. Distil on a water-bath until the distillate (as shown by volume and sp. gr.) contains 40 absolute Alcohol. This will generally measure about 52. Reserve this portion of the distillate; continue distillation to recover remaining Alcohol. Evaporate the residue on the water-bath to about 42, allow to cool, pour off the bright liquid, add this to the reserve distillate. Rinse the dish with the washings obtained in the first part of the process, filter, and evaporate to make the total volume 100.—*F. C. J. Bird, C.D.* '99, ii. 220.

This has been incorporated in the *B.P.C.*

GLYCEROLE OF IPECACUANHA.—Liquid Extract of Ipecacuanha, 100; Distilled Water, 100. Mix as in Miscible Extract, allow to stand, filter, wash the residue, evaporate the washings separately, acidify the filtrate with Acetic Acid to a very faint acid reaction, distil off the Alcohol and evaporate on a water-bath (adding the evaporated washings towards the end) to 50; add Glycerin, 50. (1 in 1)

This forms a clear solution with detannated wine, syrups, or aqueous liquids. It contains the *B.P.* proportion of alkaloid, being the same strength as the Liquid Extract, and for many obvious purposes furnishes a convenient preparation of Ipecacuanha.—*F. C. J. Bird, C.D.* '99, ii. 220.

Glycerinum Ipecacuanhæ. *Syn.* Glycerol Ipecacuanhæ,—Vinegar of Ipecacuanha, 50; Glycerin, 50.—*B.P.C.*

This contains 2½ of Liquid Extract in 100, and is, therefore, only $\frac{1}{40}$ of the strength of the above preparation.

LINCTUS IPECACUANHÆ.—Vinegar of Ipecacuanha, Syrup of Tolu, Glycerin, Mucilage of Tragacanth, of each equal parts.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

MISTURA SCILLÆ ET IPECACUANHA (*see* p. 1065).

MISTURA IPECACUANHÆ AMMONIATA.—Ipecacuanha Wine, 10 minims; Ammonium Carbonate, 5 grains; Peppermint Water, to 1 fl. oz.—*St. Mary's.*

MISTURA IPECACUANHÆ SALINA.—Ipecacuanha Wine, 6 minims; Spirit of Nitrous Ether, 20 minims; Paregoric Elixir, 20 minims; Solution of Ammonium Acetate, 1 drm.; Water, to 1 fl. oz.—*St. Mary's.*

MISTURA IPECACUANHÆ CUM SODA.—Sodium Bicarbonate, 15 grains; Ipecacuanha Wine, 10 minims; Aromatic Spirit of Ammonia, 15 minims; Peppermint Water, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

OXYMEL IPECACUANHÆ.—Liquid Extract of Ipecacuanha, 2·50; Oxymel, *q.s.* to produce 100.—*B.P.C.*

PILULA IPECACUANHÆ CUM URGINEA.—Compound Powder of Ipecacuanha, 3; Urginea, dried and in powder, 1; Ammoniacum, in powder, 1; Syrup of Glucose *q.s.* Dose.—4 to 8 grains. This Pill contains about 5 p.c. of Opium.—*Ind.* and *Col. Add.*

This has been incorporated in the *B.P.C.*

SYRUPUS IPECACUANHÆ ACETICUS.—Vinegar of Ipecacuanha, 20 fl. oz.; Refined Sugar, 36 oz.—*B.P.C. Formulary* 1901, incorporated in the *B.P.C.* under the title of **Syrupus Ipecacuanhæ.** Altered in the *B.P.C. Supplement* to 75 of refined sugar dissolved in 50 of Vinegar of Ipecacuanha, adding sufficient Distilled Water to produce 100.

Dose.—15 to 120 minims = 0·9 to 7·1 c.c.

Syrupus Ipecacuanhæ.—Tincture of Ipecacuanha, 1; Simple Syrup, 9.—Austr., Dutch, Jap., Span. and Swiss.

Belg.—Tincture of Ipecacuanha, 1; Simple Syrup, 10; evaporated to 10: also Ipecacuanha Syrupus Compositus. Compound Fluid Extract, 1; Simple Syrup, 20.

U.S.—Fluid Extract of Ipecacuanha, 7; Acetic Acid, 1; Glycerin, 10; Sugar, 70; Water, to 100.

Ger. and Hung.—Bruised Ipecacuanha, 1; Alcohol (90 p.c.), 5; Water, 40; digest 48 hours, filter, and to 40 of filtrate add 60 of Sugar, and dissolve to make 100 of Syrup.

Fr.—Alcoholic Extract of Ipecacuanha, 1; Alcohol (70°), 3; Simple Syrup 100. Fr. has also a Compound Syrup.

Mex.—Ipecacuanha, 1; Alcohol (60 p.c.), 4; Simple Syrup, 95.

All by weight except U.S.

The *Brussels Conference* agreed that the Syrup should be prepared with 10 p.c. of the tincture.

TINCTURA IPECACUANHÆ.—Bruised Ipecacuanha, 1; Alcohol (60 p.c.), 10.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Fr., Span. and Swiss, 1 in 10; Jap., 1 and 10; Hung., Mex. and Port., 1 in 5. All by weight. Not in the others.

Austr., Belg., Jap. and Swiss at least 0·2 p.c. of alkaloids.

The *Brussels Conference* agreed to a strength of 10 p.c. for the Tincture prepared by percolation with Alcohol (70 p.c.).

TINCTURA IPECACUANHÆ ET OPII. *Syn.* Fluid Dover's Powder.—Tincture of Deodorised Opium, 100; Fluid Extract of Ipecac., 10; Alcohol (49 p.c.), *q.s.* to produce 100. Evaporate the Tincture of Deodorised Opium in a tared dish on a water-bath until it weighs 80; when cold, add the Fluid Extract of Ipecac., filter, and pass enough Alcohol (49 p.c.) through the filter to make 100. Average Dose.—8 minims (0·50 c.c.).—*U.S.P.*

This has been incorporated in the *B.P.C.*, employing Extractum Ipecacuanhæ Liquidum, *B.P.*, and Alcohol (60 p.c.).

EMETINA. $C_{15}H_{22}NO_2$, eq. 245·35 or $C_{30}H_{44}N_2O_4$, 490·70.—A colourless amorphous base present in varying amount [illegible] Brazilian, Columbian and Indian Ipecacuanha Root, as given under Ipecacuanha. On exposure to light it rapidly acquires a yellow colour. It is readily soluble in Alcohol, Ether, Chloroform and Benzene; but sparingly in Water.

The chief salts for medicinal purposes are the Hydrochloride and Hydrobromide.

The name 'Emetine' used to be applied to an impure extractive, containing the mixed alkaloids of Ipecacuanha, which is now listed as **Emetine (impure)** or **Emetine (extract)**.

Tests.—Emetine melts at about 68° C. (154·4° F.). It is strongly alkaline in reaction towards Litmus, and neutralises acids completely, forming salts which are neutral in reaction towards the ordinary indicators of neutrality. It may therefore be readily determined by titration with Normal Volumetric Hydrochloric Acid Solution, using either Methyl Orange Solution or Iodeosin Solution as an indicator. 1 c.c. of Normal Volumetric Hydrochloric Acid Solution is equivalent to 0·24535 gramme of Emetine. When precipitated from the solution of one of its salts by Potassium or Sodium Hydroxide Solution, Emetine is insoluble in an excess of the reagent. This test distinguishes Emetine from Cephaëline. When dissolved in sufficient Hydrochloric Acid to effect solution and to show a slight excess, it yields, with Platinum Chloride Solution, a buff-coloured amorphous precipitate, almost insoluble in Water or Alcohol. According to Allen (*Analyst*, xxvii. 349), it yields with Ferric Chloride an indefinite colour reaction, with Sulphuric Acid containing 0·5 p.c. w/v of Molybdic Acid (Frohde's reagent), a dirty green coloration, if obtained from Rio Ipecacuanha, and a bluish coloration if obtained from Carthagena root; with Frohde's reagent and Hydrochloric Acid a grass-green coloration, with Starch and Iodic Acid, a negative reaction, and with Ferric Chloride and Potassium Ferricyanide a gradual blue coloration. It should leave no residue when ignited with free access of air.

EMETINÆ HYDROBROMIDUM. $C_{15}H_{22}NO_2$, HBr, 2 H_2O, eq. 362·46.—Crystallises from Water in beautiful silky tufts of needles. Although readily soluble in Water, it is much less soluble than the Hydrochloride, difficultly so in Absolute Alcohol or in Chloroform. The commercial salt contains 67·95 p.c. of alkaloid. It is rendered anhydrous at 100° C. (212° F.).

Tests.—Emetine Hydrobromide dissolves in Water. The solution yields on the addition of Potassium or Sodium Hydroxide Solution a precipitate insoluble in excess of the reagent. It yields when faintly acidified with Nitric Acid a yellowish-white curdy precipitate, which when washed is almost insoluble in Ammonia Water and in Nitric Acid, but is readily dissolved by Potassium Cyanide Solution; on the cautious addition of a drop or two of Chlorine Water to the aqueous solution, it yields a yellowish coloration, and if the liquid be shaken with a few c.c. of Chloroform the yellowish coloration passes into the chloroformic layer. The separated alkaloid should answer the tests distinctive of Emetine given under Emetina. It should leave no residue when ignited with free access of air.

EMETINÆ HYDROCHLORIDUM.—Crystallises from Water in radiating groups of silky filaments. Very soluble in Water, and in Alcohol. Dried at 100° C. the salt is rendered anhydrous, and then has the composition $C_{15}H_{22}NO_2HCl$, eq. 282·54. When crystallised from an acid solution $C_{15}H_{22}NO_2$, HCl, $3H_2O$, eq. 336·18. Both salts are permanent, undergoing no alteration in colour after being kept for some months.

Medicinal Properties.—A powerful emetic and expectorant. For all the uses of Ipecacuanha where vomiting is not desired, Emetine in small doses seems likely to prove of considerable value; also as an emetic in larger doses of from $\frac{1}{6}$ to $\frac{1}{3}$ grain when a more depressing action is required. The powerful local constricting effect upon blood vessels may also prove useful in hyperæmic and inflammatory conditions. The emetic dose of Emetine is about double that of Cephaëline. Emetine caused a flow of watery mucus from the nasal mucous membrane when a full dose was given; this was not noticed after Cephaëline.—*L.* '95, ii. 1276; *P.J.* '95, ii. 435.

A further communication (*B.M.J.E.* '05, i. 19) on these interesting alkaliods shows that qualitatively the action of Cephaëline is the more intense. As expectorants the alkaloids rank with Senega and Squills.

Dose.—$\frac{1}{200}$ to $\frac{1}{50}$ grain = 0·0003 to 0·0013 gramme, as an expectorant; $\frac{1}{10}$ to $\frac{1}{3}$ grain = 0·0067 to 0·022 gramme, as an emetic.

Tests.—Emetine Hydrochloride dissolves readily in Water. The solution yields the distinctive tests with Potassium or Sodium Hydroxide Solution given under Emetinæ Hydrobromidum. The separated alkaloid should conform to the distinctive tests given under Emetina. The aqueous solution faintly acidified with Nitric Acid yields with Silver Nitrate Solution a white curdy precipitate, insoluble in Nitric Acid, but which, when washed, is soluble in Ammonia Solution and Potassium Cyanide Solution. The salt should leave no weighable residue when ignited with free access of air.

VINUM EMETINÆ.—This wine should contain 3½ grains of Emetine Hydrochloride in 8 fl. oz. to be equal to Vinum Ipecacuanhæ, *B.P.*

CEPHAËLINE.—$C_{14}H_{20}NO_2$, eq. 232·44 or $C_{28}H_{10}N_2O_4$ 464·88, the alkaloid discovered by Paul and Cownley in both Brazilian and Columbian Ipecacuanha.

Colourless, crystallisable alkaloid which, like Emetine, is rapidly coloured by exposure to light. It is readily soluble in alcohol and in alkali Hydroxides; much less soluble in Ether than Emetine. It forms crystalline salts with acids.

The *B.P. Codex* differs from Paul and Cownley in stating that Cephaëline is more soluble in Ether than Emetine.

Tests.—Cephaëline, when crystallised from its concentrated solution in Ether in the presence of Water, melts at 96° to 98° C. (204·8° to 208·4° F.); when crystallised by the addition of Ammonia to a salt in the presence of Ether it melts at 102° C. (215·6° F.). It neutralises acids with the formation of salts which are neutral in reaction towards the ordinary indicators of neutrality. It may therefore be titrated with Normal Volumetric Hydrochloric Acid Solution, using either Methyl Orange, Hæmatoxylin or Iodeosin Solution as an indicator. 1 c.c. of Normal Volumetric Hydrochloric Acid Solution is equivalent to 0·23244 gramme of Cephaëline. Allen (*Analyst*, xxvii. 345) gives the following colour reactions for Cephaëline:—With Ferric Chloride, Cephaëline from Rio Ipecacuanha gives a bluish-green coloration, the alkaloid from Carthagena Ipecacuanha gives an indefinite reaction, with Sulphuric Acid containing 0·5 p.c. of Molybdic Acid (Frohde's reagent), Cephaëline from the Rio root gives a pink colour changing to green, that from the Carthagena root a reddish-purple colour; with Frohde's reagent and Hydrochloric Acid a Prussian blue colour; with Starch and Iodic Acid a negative reaction; with Ferric Chloride and Potassium Ferricyanide, Cephaëline from Rio root gives an almost immediate blue coloration, whilst that from Carthagena root yields an immediate blue.

CEPHAËLINE HYDROCHLORIDE.—Readily soluble in Water. In the dry state it has the formula $C_{14}H_{20}NO_2HCl$, eq. 268·63, but when crystallising from a slightly acid solution, it approximates to $C_{14}H_{20}NO_2HCl, 3H_2O$, eq. 322·27.

Medicinal Properties.—Cephaëline is more powerfully emetic than Emetine, and does not produce depressing effects in doses of $\frac{1}{12}$ to $\frac{1}{6}$ grain = 0·005 to 0·01 gramme, but is slow in action.—*L.* '95, ii. 1274.

Tests.—Cephaëline Hydrochloride dissolves readily in Water. The separated alkaloid should yield the distinctive tests given under Cephaëline. The aqueous solution faintly acidified with diluted Nitric Acid yields on the addition of Silver Nitrate Solution a white curdy precipitate, insoluble in Nitric Acid and, when washed, soluble in Ammonia Solution and in Potassium Cyanide Solution. The salt should leave no weighable residue when ignited with free access of air.

PSYCHOTRINE.—Pale lemon-yellow coloured, well-defined transparent prisms. Insoluble in Water, readily soluble in Alcohol or in Chloroform, the solutions becoming dark-coloured on exposure to light, and depositing a dark brown substance.

Tests.—Psychotrine melts at 138° C. (280·4° F.). It combines with acids to form salts which are neutral in reaction towards the ordinary indicators of neutrality. It may therefore be determined by titration with Normal Volumetric Hydrochloric Acid Solution, using either Methyl Orange, or Iodeosin Solution as an indicator. It appears to have a much higher molecular weight than either Emetine or Cephaëline.

According to Allen (*Analyst*, xxvii. 349), Pyschotrine gives the following colour reactions:—With Ferric Chloride the alkaloid from Rio root gives a pale cherry-red coloration, that from Carthagena root an indefinite reaction; with Sulphuric Acid containing 0·5 p.c. of Molybdic Acid (Frohde's reagent), Cephaëline from Rio root gives a pale pink coloration, that from Carthagena root a dull purple; with Frohde's reagent and Hydrochloric Acid the alkaloid from either variety gives a pale pink changing to pale green; with Starch and Iodic Acid a blue coloration is produced, the colour being more marked in the case of the alkaloid from Rio root than with that from Columbian root; with Ferric Chloride and Potassium Ferricyanide, the Psychotrine from either variety of root gives an immediate blue coloration. The most valuable means of detecting Ipecacuanha alkaloids consists in the production of Cephaëline in a crystalline form. It is readily obtained by shaking out an Amyl Alcohol or Chloroform solution of the alkaloid with a little dilute Acetic Acid. The acid liquids separated, concentrated, if necessary, and placed on a microscope slide furnished with a cell. A watch-glass or small beaker moistened with Ammonia Solution is inverted over the alkaloidal Acetate solution, when the absorbed Ammonia vapour liberates the alkaloid in characteristic crystals, which can be observed under the microscope.

Not Official.

IRIS.

The Rhizome and Roots of *Iris versicolor*, L.

Medicinal Properties.—The preparations **Iridin** and **Extractum Iridis** are purgative and diuretic. Emetic and cathartic in large doses. Used in biliousness, torpid liver and duodenal dyspepsia.

IRIDIN.—A dark brown powder, obtained from Iris.

Dose.—1 to 5 grains = 0·065 to 0·32 gramme. Given in **pill** with Extract of Henbane, but more usually combined also with Euonymin and other cholagogues.

'Diluted Glucose' is a good excipient for Iridin.

It has been known for many years as an eclectic remedy, under the names Iridin and Irisin.

Extractum Iridis of pilular consistence prepared with Alcohol (94 p.c.) was Official in *U.S.P.*, 1890, but was omitted in 1900, and a powdered extract prepared with Alcohol (60 p.c.) was included in *B.P.C. Formulary* 1901, with the synonym **Iridin**; this has been incorporated in the *B.P.C.*

Not Official.

ISPAGHULA.

The dried Seeds of *Plantago ovata*, Forsk.

Demulcent, and mildly astringent. They are given (whole) in protracted diarrhœa in India. In their passage through the alimentary canal they absorb Water, swell up and yield a bland demulcent mucilage. Official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Dose.—50 to 150 grains = 3·2 to 10 grammes.

DECOCTUM ISPAGHULÆ.—Boil 120 grains of bruised Ispaghula with 24 fl. oz. of Distilled Water for 10 minutes, strain, and make up to 20 fl. oz. by rinsing contents of strainer with more of the Water, if necessary.

Dose.—½ to 2 fl. oz. = 14·2 to 56·8 c.c.

This is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies. It has been incorporated in the *B.P.C.*

Not Official.

IZAL.

A distilled product from coke, introduced as a non-poisonous disinfectant, and sold in three forms: (1) medical Izal; (2) an emulsion containing 40 p.c. of the refined oil; (3) ordinary Izal, an emulsion containing 40 p.c. of unrefined oil.

Izal in the treatment of phthisis. 10 minims = 0·6 c.c., mixed with Cod-liver Oil given internally, and as an inhalation by evaporation at the bedside, and as a solution in paroleine used as a spray.—*L.* '02, i. 146.

Intra-tracheal injection of Izal Oil in phthisis, 60 minims of a 10 p.c. solution of Izal Oil in Glycerin.—*B.M.J.* '02, i. 479; *Trans. Brit. Cong. Tub.*, iii. 413; also Izal, 20 minims in Glycerin, 1 oz.; with occasionally 10 minims Guaiacol added.—*B.M.J.* '03, i. 545.

Recommended (*B.M.J.* '04, ii. 1520) in the treatment of ringworm, the pure Izal being well rubbed into the scalp.

In dysentery.—*I.M.G.* '05, ii. 261. From 1 to 2 drm. in a pint of Water at 100-104° F. (37·7 to 40° C.). From 1 to 2 pints of the solution are run into the large gut, the injection being retained from 10 to 15 minutes. The treatment should be carried out twice daily in acute cases and once in subacute and chronic cases. Fifteen to 25 minims six or seven times a day in dysentery (*I.M.G.* '05, ii. 281), the drug being made up with Chloric Ether, Cardamoms and Glycerin or with Spirits of Chloroform and Peppermint.

Izal Oil as an intestinal disinfectant, given in doses of 1 to 3 capsules containing 2 minims = 0·12 c.c. of Izal Oil in each.

JABORANDI FOLIA.

JABORANDI LEAVES.

The dried Leaflets of *Pilocarpus Jaborandi*, Holmes.

The Jaborandi Leaves of commerce have been very variable, and are the produce of different varieties of Pilocarpus.

The principal alkaloid is Pilocarpine, a syrupy liquid, forming crystalline salts, the Hydrochloride and Nitrate are most used, *see* pp. 893, 895. They also contain Isopilocarpine, which possesses similar but weaker properties, and from 0·2 p.c. to 1·1 p.c. of an ethereal oil. Pilocarpine and Isopilocarpine are isomeric. The *B.P.* does not require the leaves to conform to any definite alkaloidal standard. They vary considerably in the amount of Pilocarpine they contain, generally about 0·5 p.c. It is still an open question whether in the present state of our knowledge of the alkaloids, the standardisation can be justified. Jowett (*Y.B.P.* '99, 435; *C.D.* '99, i. 203) is of opinion that it is possible to determine the amount of alkaloid with a fair degree of accuracy. The information is, however, of little value, for it gives no indication of the amount of Pilocarpine contained in the total alkaloids, and it must be assumed that on the Pilocarpine alone depends the therapeutic value of the preparation.

It has been recommended that, if the drug is retained, *Pilocarpus microphyllus* should be substituted for the present official variety, and that the galenical preparations be standardised. The limit suggested for the leaves is 0·5 to 0·75 p.c. of total alkaloid. The ratio of Pilocarpine to other alkaloids appears to be practically constant in this variety.

The Leaflets of *Pilocarpus Jaborandi*, Holmes, and of *Pilocarpus microphyllus*, Stapf, are official in the *U.S.P.*, and are required to yield not less than 0·5 p.c. of alkaloids.

Jaborine is a mixture of Pilocarpine, Isopilocarpine, and, possibly, a trace of Pilocarpidine, with a trace of colouring matter.

Medicinal Properties.—Powerful and prompt diaphoretic, sialagogue, and galactagogue. Useful in the dropsy, uræmia and thirst of Bright's disease. It is antagonistic in its action to Belladonna. The salts of Pilocarpine, owing to their more constant action, are more generally used than the galenical preparations of Jaborandi. *See* also Pilocarpinæ Nitras.

Official Preparations.—Extractum Jaborandi Liquidum and Tinctura Jaborandi. Used in the preparation of Pilocarpinæ Nitras.

Foreign Pharmacopœias.—Official in Austr., Belg., Fr., Ger., Ital., Jap., Mex., Port., Span. and Swiss; U.S. (Pilocarpus). Not in the others.

Descriptive Notes.—The Leaves of *Pilocarpus Jaborandi*, Holmes, official in the *B.P.*, are no longer obtainable in commerce. They are described as dull green, oval oblong or oblong lanceolate, from 2½ to 4 in. (6 to 10 cm.) in length (8 to 16, mostly 12, cm., *P.G.*), 12 cm. long and 3 to 4 in. broad, *U.S.P.*), obtuse and emarginate at the apex, and unequal and shortly petiolate at the base, with an entire, slightly revolute margin, of a coriaceous texture, glabrous, or with a few scattered hairs on the under surface, and with the lateral veinlets distinctly prominent on the upper surface, containing numerous oil glands, and having an aromatic odour, pungent taste, and increasing the flow of saliva when chewed.

The Leaves which are now in commerce are those of *Pilocarpus pennatifolius*, Lem., from Paraguay, which are very similar in size and shape, but have a greyish-green colour, the lateral veinlets are scarcely prominent on the upper surface, and the base of the leaf is usually equal and tapering. The leaves of *P. trachylophus*, Holmes, are similar in shape to those of *P. Jaborandi*, but rather smaller, with prominent veins on the upper surface and revolute margins, but are of a brownish-green tint, and covered on the under surface with curved simple hairs, and there are usually only two pairs of leaflets on the leaves besides the terminal one, whereas in *P. Jaborandi* and *P. pennatifolius* there are three or four pairs. The leaflets of *Pilocarpus microphyllus*, Staff., are very much smaller (1·2 to 3·7 cm. long, 0·8 to 1·6 cm. broad, *U.S.P.*), the lateral ones sessile, rhomboid oval, or obovate obtuse and emarginate, with pellucid glands, veins coarsely reticulated, but not very prominent, almost odourless, but resemble Jaborandi in taste. These leaves contain about the same quantity of Pilocarpine as those of *P. Jaborandi*, and are largely used for the preparation of the alkaloid; they are the only kind that can replace the official leaves of the *B.P.* so as to give a preparation of equal strength. Unfortunately, there is a spurious leaf very like it offered in the market at intervals, derived from *Swartzia decipiens*, Holmes, a leguminous plant, not possessing the properties of Jaborandi. These may be distinguished by having very short hairy stalks about 1 mm. long, by the veinlets being more or less translucent, and by the presence of smaller rounded leaflets mixed with the ovate or oval leaflets. *See* *P.J.* (4) iii. 2. Other varieties of Jaborandi which have appeared in the market, but not regularly, are described in *P.J.* (4) i. 501,

(4) xvii. 713. The last, which comes from Guadaloupe, contains as much Pilocarpine as the Paraguay Jaborandi. It is derived from *Pilocarpus racemosus*, Vahl. It has larger, broader, and somewhat obovate leaves. The *P.G.* gives as a distinguishing feature of Jaborandi Leaves that the palisade cells should be about one-fifth of the thickness of the leaf. In powder, Jaborandi may be recognised by polygonal epidermal cells with a strongly striated cuticle, thick-walled bast fibres, one-celled hairs, seriate cluster crystals and the palisade cells. The epidermal cells of *Swartzia decipiens* are very sinuous, and there are pluri-cellular hairs, the terminal cells being largest, on the nerves. Recently the leaves of a species of *Casearia*, Nat. Ord. Samydaceæ, have been offered as Jaborandi. They are oblong, elliptic, tapering towards both ends, thinner, and have linear, as well as round, oil receptacles in the leaves.

Tests.—The method adopted by the *U.S.P.* for the assay of the Leaves is essentially as follows:—A weighed quantity of 10 grammes of the Leaves in No. 60 powder is moistened with 2 c.c. of Ammonia Solution and 3 c.c. of Chloroform, and packed firmly in a small cylindrical percolator provided with a pledget of cotton-wool firmly packed in the neck, and slowly percolated with Chloroform containing about 2 p.c. of Ammonia Solution, until exhausted, about 100 c.c. usually being sufficient. The percolate is transferred to a separator, and the alkaloids removed by shaking with 15 c.c. of Normal Volumetric Sulphuric Acid Solution, the acid liquid being separated and transferred to a second separator, the extraction of the alkaloidal residue being continued with a second quantity of a mixture of 2 c.c. of Normal Volumetric Sulphuric Acid Solution and 8 c.c. of Water, followed by 10 c.c. of Water, the aqueous acid portion and the aqueous portion being separated in each instance and transferred to the second separator. After the addition of sufficient Ammonia Solution to render the liquid alkaline, the liberated alkaloids are extracted by shaking with three successive quantities of 20 c.c., 15 c.c. and 10 c.c. of Chloroform, the chloroformic solution separated in each instance, transferred to a beaker or flask, the Chloroform evaporated at a gentle heat, the alkaloidal residue dissolved in 7 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution and the excess titrated with Fiftieth-normal Volumetric Potassium Hydroxide Solution, using Cochineal or Iodeosin Solution as an indicator of neutrality. The number of c.c. of Fiftieth-normal Volumetric Potassium Hydroxide Solution used divided by 5, the quotient subtracted from 7, the remainder multiplied first by 0·02 and then by 10, yields the percentage of total alkaloids in terms of Pilocarpine present in the sample. The Leaves yield from 1 to 7 p.c. of ash.

Preparations.

EXTRACTUM JABORANDI LIQUIDUM. Liquid Extract of Jaborandi.

20 of Jaborandi Leaves, in No. 20 powder, percolated with Alcohol (45 p.c.), until 67 volumes have been obtained. Reserve the

first 17 and evaporate the remainder to a soft extract, which is dissolved in the first portion and made up with Alcohol (45 p.c.) to 20. (1 in 1)

The Liquid Extract of Jaborandi official in the *B.P.* is not a standardised preparation, though it has been recommended that, if retained, it should be standardised and a method of assay given. The *U.S.P.* Fluid Extract is required to contain 0·4 p.c. w/v of the alkaloids from Pilocarpus. The *P.G.* does not include a Fluid Extract.

Dose. 5 to 15 minims = 0·3 to 0·9 c.c.

Foreign Pharmacopœias.—official in U.S., Fluidextractum Pilocarpi, 1 in 1 and standardised; *B.P.* '85 had a solid **Extractum Jaborandi** prepared with Alcohol (57 p.c.), and *B.P.C.* have adopted this, using Alcohol (60 p.c.); *B.P.C.* have also **Infusum Jaborandi,** 1 in 20 of boiling Water, infused 15 minutes. Not in the others.

Tests.—Liquid Extract of Jaborandi has a sp. gr. of 1·010 to 1·040; contains from 12·0 to 22·0 p.c. w/v of total solids; and about 34 p.c. w/v of Absolute Alcohol. As mentioned above, the official preparation is not standardised, and no method is given for the determination of the total alkaloids. It may be conveniently assayed by the method suggested by Farr and Wright (*Y.B.P.* '99, 381; *C.D.* '99, ii. 205). A measured quantity of 10 c.c. is acidified with dilute Sulphuric Acid and evaporated on a water-bath to a syrupy consistence, 30 c.c. of Alcohol (90 p.c.) added, and the mixture well stirred and allowed to stand for an hour. The liquid portion is then separated by decantation or filtration, the mucilaginous deposit dissolved in a little acidulated Water, and the treatment with Alcohol repeated. The dish and filter are rinsed with a little Alcohol, the filtrates and rinsings bulked and evaporated over a water-bath, Water being added from time to time until all the Alcohol has been removed. The residual liquor is transferred to a separator, the dish washed with a few drops of Water, and the whole rendered alkaline with Ammonia Solution. The liberated alkaloids are shaken out with two successive quantities, each of 15 c.c., of Chloroform, the chloroformic solutions are separated in each case, mixed, and the alkaloids extracted by shaking with three successive quantities of 9 c.c. each of a mixture of 25 c.c. of Water and 2 c.c. of Semi-normal Volumetric Sulphuric Acid Solution. The acid solutions are separated in each case, mixed, rendered alkaline with Ammonia Solution, and the liberated alkaloids shaken out with two successive quantities each of 15 c.c. of Chloroform. The chloroformic layer is separated in each case, the liquids mixed, the Chloroform evaporated over a water-bath, the alkaloids dried and weighed. The residue is dissolved in a little Alcohol (90 p.c.), a calculated excess of Tenth-normal Volumetric Hydrochloric Acid Solution and some Water added, and the excess of Volumetric Acid titrated with Twentieth-normal Volumetric Sodium Hydroxide Solution, using Cochineal Solution as an indicator of neutrality. Specimens of the Liquid Extract examined in the author's laboratory by the above process gave gravimetrically 0·2, 0·39, and 0·26 p.c. w/v of total alkaloids, the volumetric determination giving 0·14, 0·3, and 0·16 p.c. w/v. In performing the volumetric determination, a small deviation was made from Farr and Wright's method. The alkaloidal residue was dissolved in a measured excess of Tenth-normal Volumetric Hydrochloric Acid Solution, and the excess of Volumetric Acid determined by titration with Hundredth-normal Volumetric Sodium Hydroxide Solution, using Iodeosin Solution as an indicator of neutrality. Farr and Wright, in the examination of 12 specimens of the Liquid Extracts, found from 0·03 p.c. w/v to 0·24 p.c. w/v, and an average of 0·15 p.c. w/v of total alkaloids.

The method of determination adopted by the *U.S.P.* is essentially as follows:—A measured quantity of 10 c.c. is dropped on to a little clean sand, contained in a porcelain evaporating basin, and evaporated to dryness on a water-bath. The extract is mixed uniformly with the sand, transferred to an Erlenmeyer flask, the dish rinsed with a mixture of 25 c.c. of Chloroform and 2½ c.c. of Ammonia Solution, which is transferred to the flask, and the whole well shaken at intervals for an hour. The liquid is decanted into a separator, the residue washed with several portions of Chloroform, which are drawn off and filtered into the separator. The alkaloids are extracted from the chloroformic solution by shaking first with 15 c.c. of Normal Volumetric Sulphuric Acid Solution, then with a mixture of 5 c.c. of a similar Volumetric Acid solution and 5 c.c. of Water, and finally with 10 c.c. of Water. The acid, acid and aqueous, and aqueous shakings are separated, transferred to a second separator, rendered alkaline with Ammonia Solution, and the liberated alkaloids shaken out with three successive quantities of 20 c.c., 15 c.c., and 10 c.c. each of Chloroform. The chloroformic layer is separated in each case, the chloroformic solutions mixed, the Chloroform evaporated on a water-bath, and the alkaloidal residue is dissolved in 8 c.c. of Tenth-normal Volumetric Sulphuric Acid, the excess of Volumetric Acid being titrated with Fiftieth-normal Volumetric Potassium Hydroxide Solution. The number of c.c. required divided by 5, the quotient subtracted from 8, and the remainder multiplied first by 0·02 and then by 10, yields the percentage w/v of total alkaloids in terms of Pilocarpine present in the Fluid Extract. It may be noticed in this instance that an error appeared in the *U.S.P.*, 5 c.c. was mentioned as the quantity of Tenth-normal Volumetric Sulphuric Acid Solution to be used in dissolving the alkaloidal residue, whereas in the subsequent calculation of the volumetric result, the quotient obtained by dividing the number of c.c. of excess Fiftieth-normal Volumetric Potassium Hydroxide Solution 5, was directed to be subtracted from 8. This was corrected in the Additions and Corrections (1907).

In criticising a paper on standards of medicines, Jowett (*P.J.* '02, ii. 672) states that he, in conjunction with Professor Marshall, has shown, he trusts conclusively, that the galenical preparations of Jaborandi were unreliable, and, furthermore, unnecessary, as the whole therapeutic activity of Jaborandi Leaves can be obtained by Pilocarpine, which might, therefore, be used in place of any galenical preparation. They show the fallacy of attempting to standardise the Liquid Extract on a percentage of total alkaloids. Of two specimens of Liquid Extract yielding 0·21 p.c. and 0·25 p.c. of total alkaloid respectively, one yielded no crystalline Pilocarpine Nitrate and the other 0·082 p.c. They claim that Pilocarpine Nitrate should be the official salt and all galenical preparations of Jaborandi abandoned.

Farr and Wright (*P.J.* '03, i. 9) do not admit Jowett's conclusions, and consider that they are not justified by the facts recorded in the paper referred to in his letter. The titration figures of the alkaloidal residues obtained in their research based on the molecular weight of Pilocarpine, were in close accord with the gravimetric results showing that the alkaloid was practically pure. They consider there is absolutely nothing in Jowett and Marshall's work to show that any one of the four samples of Liquid Extract used for the physiological experiments was the official article. Judging from the fact that two of them apparently contained little or no Pilocarpine, and the other two quite trifling proportions, it is tolerably certain that they were commercial products of a spurious Jaborandi, and not of the official variety. So long as the demand for galenicals exists, so long will standardisation be required. For the great majority of preparations of alkaloidal drugs the best, because the most natural standard, is one of total alkaloids. Jowett in reply (*P.J.* '03, i. 41) shows that the case for the expulsion of galenical preparations of Jaborandi does not rest only on two assumptions, but points out that the physiological action of Jaborandi is fully produced by pure Pilocarpine, the purity being assured by constancy of the m.p. and specific rotation after repeated crystallisation. Farr and Wright's statement that the titration figures based on the molecular weight of Pilocarpine were in close accord with the gravimetric results, showing that the alkaloid was practically pure, indicate that they ignore the existence of Isopilocarpine as well as that of Pilocarpidine. Isopilocarpine, although isomeric with Pilocarpine, possesses but one-eighth of the physiological activity of the latter, and would give precisely the same figures on titration. The alkaloid which Farr and Wright assume to have been practically pure might, therefore, from their results, have consisted entirely of Isopilocarpine and contained no Pilocarpine. With regard to the Liquid Extracts, the four preparations were guaranteed as such by three prominent wholesale druggists, and such as would be largely distributed to the pharmacists of this country. The object was to determine the therapeutic value of the preparations of Jaborandi such as would be used in dispensing, for which purpose the specimens referred to were purchased from three manufacturing houses of the highest repute.

Farr and Wright (*P.J.* '03, i. 71) still maintain that, as isolated by the process employed by them, the total alkaloids consist of almost pure Pilocarpine. They consider that the proportion of alkaloid, other than Pilocarpine is so small that it may be safely ignored, and quote the results of Jowett's examination of the genuine drug. With regard to the galenical preparations, they think that the explanations given in his letter have not improved his position. It is certain that the official Jaborandi is an exceedingly active drug, and equally certain that the same degree of activity will be manifested by a Liquid Extract if carefully prepared. They repeat that the research does not justify the wholesale denunciation of the galenical preparations of the official drug.

TINCTURA JABORANDI. Tincture of Jaborandi.

4 Jaborandi Leaves, in No. 40 powder, percolated with Alcohol (45 p.c.), to yield 20.

The Official Tincture is not a standardised preparation. The *U.S.P.* does not include a Tincture.

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Fr. and Mex., 1 in 5; Span., 1 in 10. Not in the others.

Wright and Farr (*P.J.* (3) xxii. 1) show an enormous variation in the strength of various samples of this tincture, viz., from 0·032 to 0·148 p.c. of alkaloid, and recommend a standard of 0·1 p.c.

Tests.—Tincture of Jaborandi has a sp. gr. of 0·950 to 0·960; contains from 2·5 to 3·5 p.c. w/v of total solids; and about 40 p.c. w/v of Absolute Alcohol. A standard of 0·048 p.c. w/v of total alkaloids has been suggested for the Tincture.

A convenient method for the determination of the total alkaloids is that of Farr and Wright. With the exception that a measured quantity of 50 c.c. of the Tincture is substituted for 10 c.c. of the Liquid Extract, the process may be conducted as described under the heading of Extractum Jaborandi Liquidum.

A Tincture prepared in the author's laboratory had a specific gravity of 0·955, contained 2·5 p.c. w/v of total solids and 40·3 p.c. w/v of Absolute Alcohol. When assayed according to the method mentioned above, it yielded gravimetrically 0·036 p.c. w/v of alkaloids, which on titration showed 0·036 p.c. w/v reckoned as Pilocarpine.

PILOCARPINÆ NITRAS. *See* p. 893.

JALAPA.

JALAP.

Fr., Jalap; Ger., Jalapenwurzel; Ital., Gialappa; Span., Jalapa.

The dried Tubercules of *Ipomœa Purga*, Hayne.

It contains, as its principal ingredient, a glucoside, **Convolvulin**. soluble in Alcohol, but insoluble in Ether, and constituting all but a small part of Resina Jalapæ, *B.P.*

The *B.P.* requires that Jalap should yield not less than 9·0 p.c., nor more than 11·0 p.c. of Resin answering the official requirements; the *U.S.P.* not less than 7 p.c. of total Resin, of which not more than 15 p.c. should be soluble in Ether; the *P.G.* at least 9·0 p.c. of Jalap Resin.

Medicinal Properties.—A brisk cathartic, operating sometimes painfully, producing copious watery discharges. From its hydragogue powers, it is especially serviceable in dropsy and cerebral congestion, when it is usually prescribed in the form of the Compound Powder.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Swiss, maximum single dose, 1·0 gramme; maximum daily dose, 5·0 grammes.

Prescribing Notes. -*The powder can be given in* **cachets,** *or mixed with Confections. The Resin is given in* **pills** *made by adding 'Diluted Glucose,' q.s.*

Official Preparations. —Extractum Jalapæ, Pulvis Jalapæ Compositus, Jalapæ Resina, Tinctura Jalapæ; used in the preparation of Pulvis Scammonii Compositus. The **resin** is contained in Pilula Scammonii Composita.

Not Official.—Mistura Jalapæ cum Rheo, Pilula Jalapæ, Tinctura Jalapæ Composita, Sapo Jalapinus, Jalapin.

Foreign Pharmacopœias.—Official in Austr., Hung. and Swiss, at least 10 p.c. of Resin; Belg., Dutch and U.S., 8 p.c.; Dan., Fr., Norw. and Swed., 7 p.c.; Ger., Jap. and Russ., 9 p.c.; Ital. (Gialappa), 12 p.c.; Mex., 11 p.c.; Span., 15 to 18 p.c.

The Fr. Codex (1884) fixed the standard at 15 to 18 p.c. of Resin, lowered in 1908 to 7 p.c.; U.S. (1880 and 1890) at 12 p.c.; Ger. (1890) lowered the figure to 7 p.c., but (1900) increased it again to 'at least 9 p.c.'

Descriptive Notes.—The Jalap of commerce is usually imported from Vera Cruz. and consists of ovoid, or more or less broadly fusiform or subspherical roots, averaging about 1½ to 3 in. (1 to 3 in., 2½ to 7½ cm. *B.P.*), but is sometimes 4 to 5 in. or more in diameter. The larger roots are often incised to facilitate drying. Externally the roots are of a dark greyish-brown colour, furrowed and wrinkled, and marked with numerous short transverse paler scars or lenticels. A transverse section exhibits a yellowish-grey or brown tint with irregular darker concentric rings, consisting of Resin cells; it has a smoky odour, and at first a sweetish, then an acrid taste and a disagreeable flavour. There is considerable difference in the density of the roots as met with in commerce, the light pieces containing most Resin, the heavier pieces apparently owing their weight to sugar, which is difficult to entirely separate from the Resin. Jalap has been cultivated in India and Jamaica, and these roots differ from the Mexican in their paler and more starchy appearance internally. The Indian, which shows a tendency to a fusiform shape, is sometimes unusually rich in Resin; the Jamaica Jalap more frequently presents a sub-globular form; it has sometimes been imported in the form of transverse slices, but since the comparative disuse of the drug of late years and the consequent fall in price, the exportation from thence has apparently ceased. Powdered Jalap is characterised by the starch grains, often compound and sometimes amorphous from the action of heat, by the laticiferous cells and globules of resin escaped from them, the pitted vessels as well as tracheids, sphærocrystals of Calcium Oxalate often 2 to 5 in a parenchymatous cell, and sclerenchymatous cells. A variety of Jalap known in commerce as Tampico Jalap, derived from *Ipomœa simulans*, Hanbury, is occasionally imported. It is more fusiform, smaller, more shrunken, and does not exhibit pale transverse lenticels. The root of another species, *Ipomœa Orizabensis*, Ledan, has been recently imported in large quantities under the name of Mexican Scammony Root. This root is spindle-shaped and about 2 feet long, and occurs in commerce under the name of Stalk Jalap, in irregularly rectangular pieces 1 or 2 inches in diameter and 2 to 3 inches long, which exhibit a radiate transverse section, and numerous thick bundles of vessels projecting as stiff fibres from the fractured surface.

Tests.—The Resin of Jalap is soluble in Alcohol (90 p.c.), and this solvent is officially employed for its determination. A weighed quantity of, say, 10 grammes of the Jalap in fine powder is digested at a gentle heat for 24 hours with twice its weight of Alcohol (90 p.c.), transferred to a percolator, and percolated with Alcohol (90 p.c.) until nothing further is dissolved. The alcoholic solution is precipitated by the addition of Water, the Alcohol distilled, the residue is transferred whilst hot to a dish, cooled, and the supernatant liquid removed, the Resin washed with hot Water, dried and weighed. It should weigh not less than 0·9 nor more than 1·1 gramme. This weight multiplied by 10 yields the p.c. w/w of Resin present in the sample.

The *U.S.P.* distinguishes between the Ether-soluble and the Ether-insoluble Resin. A weighed quantity of 10 grammes of Jalap in No. 60 powder is percolated in a well-covered percolator, with Ether [sp. gr. 0·716 at 25° C. (77° F.)] until 50 c.c. of percolate have been obtained. The percolate is transferred to a tared beaker, the Ether evaporated on a water-bath and the residue weighed. The weight multiplied by 10 gives the percentage of Ether-soluble Resin. The percolation is continued with Alcohol (94·9 p.c.) until 100 c.c. of percolate have been obtained. A measured quantity of 20 c.c. of this percolate is transferred to a separator, mixed with 20 c.c. of Chloroform, and shaken for 1 minute with 20 c.c. of Water. The Chloroform layer is separated, transferred to a tared beaker, the separator washed with 5 c.c. of Chloroform, and the mixed chloroformic liquids are evaporated to dryness on a water-bath, the residue dried till constant in weight and weighed. This weight multiplied by 50 gives the percentage of Resin insoluble in Ether. The sum of the two weights represents the total Resin. The *P.G.* exhausts 1 part by weight of coarsely-powdered Jalap Root for 24 hours at a temperature of 35° to 40° C. (95° to 113° F.), first with 4 parts by weight of the Alcohol (90 p.c.) and then with a further 2 parts by weight of the Alcohol. The Alcohol is distilled off, the residue of Resin is washed with warm Water, until it no longer colours the latter. The Resin is dried in the water-oven and weighed. The *French Codex* 1908 adopts a standard of 7 p.c. of Jalap Resin, which is lower than either the *B.P.* or *P.G.*; the *U.S.P.* standard of not less than 8 p.c. of total resin, of which not more than 1·5 p.c. should be soluble in Ether, was altered by the Additions and Corrections 1907 to not less than 7 p.c. of total resin, of which not more than 15 p.c. should be soluble in Ether.

The ash of Jalap varies from 4 to 6 p.c. and should not exceed the latter figure.

The retention of the present official standard for the percentage of Resin has been recommended.

Preparations.

EXTRACTUM JALAPÆ. EXTRACT OF JALAP.

Jalap, in coarse powder, 1; Alcohol (90 p.c.), 5; Distilled Water, 10. A solid Extract prepared by treating the Jalap first with the Alcohol and subsequently with the Water, and combining the two residues into one Extract.

100 lb. of Jalap yielded 50 lb. of Extract.

Dose.—2 to 8 grains = 0·13 to 0·32 gramme.

PULVIS JALAPÆ COMPOSITUS. COMPOUND POWDER OF JALAP.

Jalap, 5; Acid Potassium Tartrate, 9; Ginger, 1. (1 in 3)

Dose.—20 to 60 grains = 1·3 to 4 grammes.

Foreign Pharmacopœias.—Official in Russ., Jalap 1, Potassium Bitartrate 2; U.S., Jalap 35, Potassium Bitartrate 65; Mex. Not in the others.

JALAPÆ RESINA. JALAP RESIN.

Extracted from Jalap by exhausting with Alcohol (90 p.c.), and purified by washing with Water.

Dose.—2 to 5 grains = 0·13 to 0·32 gramme.

Ital., maximum single dose, 0·3 gramme; maximum daily dose, 1·0 gramme.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—Jalap Resin, when powdered, is officially required to yield little or nothing to warm Water, and not more than 10 p.c. to Ether. It is readily soluble in Alcohol (90 p.c.), insoluble in Turpentine Oil. The *U.S.P.* requires that not more than 15 p.c. should be soluble in Ether, that it should be soluble in Alcohol (94·9 p.c.) in all proportions, and that the alcoholic solution should be only faintly acid to blue Litmus paper. It also requires that not more than 35 p.c. should be soluble in Chloroform. The *B.P.* mentions not more than 10 p.c. as the Ether-solubility limit. The *P.G.* says readily soluble in Alcohol (90 p.c.), and not more than 10 p.c. should be soluble in Chloroform, but makes no reference to Ether-solubility. The *U.S.P.* requires that it shall possess an Acid value of not more than 13·93 and a Saponification value of at least 139·35. The *U.S.P.* states that the Resin should not suffer material loss of weight when heated at 100° C. (212° F.), and that the anhydrous Resin melts about 150° C. (302° F.). Both the *U.S.P.* and *P.G.* require that the Resin should be completely soluble in 5 times its weight of Ammonia Solution, and when this solution is acidified only a slight turbidity at the most should be produced. The *P.G.* warms the Resin with the Ammonia Solution, and requires, in addition, that the solution shall not gelatinise on cooling. It uses Acetic Acid for acidification, whilst the *U.S.P.* employs Hydrochloric Acid. That the Resin should be soluble in 5 times its weight of Ammonia Water is a reasonable requirement, but few samples will be found to respond to the latter half of the test.

The more generally occurring impurities are Scammony Resin and the Resin of Tampico Jalap, Guaiacum Resin, Colophony, Water, and soluble impurities. Scammony Resin and the Resin of Tampico Jalap are detected by the Ether-solubility test; Guaiacum Resin by Ferric Chloride T.S. failing to produce any greenish-blue coloration in the Alcohol (90 p.c.) solution; Colophony greatly increases the Acid value and is also readily detected by the Ammonia test. Water is detected by loss of weight at 100° C. (212° F.), and soluble impurities by evaporating a filtered aqueous trituration of the Resin to dryness; the filtered liquid should be colourless, and no solid residue should remain.

Water.—Jalap Resin when triturated with 10 parts of Water should give an almost colourless filtrate, *P.G.*; Water should not become coloured by it nor dissolve any portion of it, *U.S.P.*

Chloroform.—Not more than 35 p.c. of the Resin should be soluble in Chloroform, *U.S.P.;* if 1 gramme be warmed with 10 grammes of Chloroform and the product filtered, the filtrate after evaporation should not leave a residue of more than 0·1 gramme, *P.G.*

Ammonia.—If Jalap Resin be warmed in a well-closed vessel with 5 parts of Ammonia Solution, a solution should be obtained which, on cooling, is not gelatinous, and on evaporation leaves a residue soluble in Water, all but an insignificant resinous portion. On supersaturating the solution with dilute Acetic Acid a faint turbidity at most should be produced, *P.G.;* slowly but completely soluble in 5 parts (by weight) of Ammonia Water, and when this solution is acidified with Hydrochloric Acid only a slight turbidity should appear, *U.S.P.*

Ferric Chloride.—A few drops of Ferric Chloride T.S. added to some of the powdered Resin, moistened with Alcohol, should produce no greenish-blue colour, *U.S.P.*

Acid Value.—1 gramme of Jalap Resin dissolved in 50 c.c. of Alcohol containing 1 c.c. of Phenolphthalein T.S. should require not more than 0·5 c.c. of Semi-normal Alcoholic Potassium Hydroxide Volumetric Solution to produce a red colour (limit of acid resins), *U.S.P.*

Saponification Value.—If to 1 gramme of Jalap Resin dissolved in 50 c.c. of Alcohol in a flask, 25 c.c. of Semi-normal Alcoholic Potassium Hydroxide Volumetric Solution be added and the mixture be heated on a water-bath for one hour, and if the excess of Alkali be titrated with Semi-normal Volumetric Sulphuric Acid Solution, using 5 drops of Phenolphthalein T.S. as indicator, at least 20 c.c. of Semi-normal Sulphuric Acid Volumetric Solution should be required, *U.S.P.*

TINCTURA JALAPÆ. Tincture of Jalap.

A Tincture obtained by treating Jalap with Alcohol (90 p.c.), and standardising it to contain 1·5 of the Resin in 100 cc., which is equal to 1 of Root in 6 or 7 of Alcohol (90 p.c.).

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Belg., 1 in 50 from Resin; Port., 1 and 5 by weight. Not in the others.

Tests.—Tincture of Jalap has a sp. gr. of 0·905 to 0·910; contains about 3·5 p.c. w/v of total solids, and about 68·0 p.c. w/v of Absolute Alcohol. It contains about 1·5 p.c. of Jalap Resin.

Not Official.

MISTURA JALAPÆ CUM RHEO.—Jalap Resin, ¼ grain; Compound Tincture of Rhubarb, 10 minims; Tragacanth, ¼ grain; Syrup of Ginger, 5 minims; Glycerin, 10 minims; Caraway Water, to 1 fl. drm.

Powder the Resin, mix with the Tragacanth, add the Tincture and then the other ingredients in the order given. Dose.—1 fl. drm. for a child 1 year old.—*St. Thomas's.*

Note.—The official extract of Jalap varies considerably in strength, hence the Resin of Jalap is used, with Tragacanth to suspend it.

This has been incorporated in the *B.P.C.*

TINCTURA JALAPÆ COMPOSITA.—Jalap, 8; Scammony, 2; Turpeth,* 1; Alcohol (60 p.c.), to 100.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Official in the *Ind.* and *Col. Add.* for India, the Eastern Colonies and North American Colonies.

This has been incorporated in the *B.P.C.*

Fr., Mex., Port. and Span., similar to above; Belg., Jalap 1, Scammony 1·5, Tincture of Ginger, 2·5, Alcohol (80 p.c.) 950; Swiss, Jalap 10, Scammony 10, Diluted Spirit, to 100.

PILULA JALAPÆ.—Jalap Soap, 3; Powdered Jalap, 1.—*Ger.*

SAPO JALAPINUS.—Resin of Jalap, 1; Soap, 1.—*Ger.*, *Jap.* and *Swiss.*

JALAPIN.—A purified Resin of Jalap, entirely soluble in Ether.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

Tampico Jalap from *Ipomœa simulans*, Hanb., and Orizaba root (Woody Jalap), from *Ipomœa Orizabensis*, Ledan., also yield a glucoside Jalapin, soluble in Ether, and almost, if not completely, identical with Resina Scammonii, *B.P.*, from *Convolvulus Scammonia*, L.

It is unfortunate that the name Jalapin should have been applied to the resin of *spurious* Jalap, which is identical with the *true* Resin of Scammony, and which is quite distinct from the official Resin of Jalap.

During 1892 attention was again called to this misleading nomenclature (*P.J.* (3) xxii. 888), and considerable correspondence ensued. It appears that it has been customary in this country to apply the term 'Jalapin' to the true Jalap Resin, but the article imported from Germany under that name is invariably the Ether-soluble Resin from spurious Jalap or Scammony. Several suggestions were made, but none which seemed at all likely to be acceptable both in Britain and Germany. The most feasible proposal is that the term **'Scammonin'** should be used to designate the Ether-soluble Resin (shown, *P.J.* (3) xxiii. 86, to be identical from either of the previous-named sources), and that the earliest opportunity should be taken to make official, under the name **Jalapin,** an Ether-wholly-insoluble Resin from true Jalap.

Not Official.

JAMBUL.

The Seeds of *Eugenia Jambolana*, Lam., which have been used in India and this country for reducing the amount of sugar excreted in diabetes.—*P.J.* (3) xviii. 921; *B.M.J.* '91, ii. 1283; *B.M.J.E.* '92, i. 39; *T.G.* '93, 611; *Pr.* li. 138; *B.M.J.* '01, ii. 618.

The dose should be large, 1 drm. to 1 oz. daily.—*B.M.J.* '91, ii. 1284.

Two cases in which 2 oz. were given daily.—*Pr.* li. 139.

It can also be given in the form of **fluid extract** (1 in 1). Dose, 10 to 60 minims = 0·6 to 3·6 c.c.

Not Official.

JEQUIRITY.

The Seeds of *Abrus precatorius*, L.

Infusum Abri, 8 of the **seeds** to 100 of Water at 120° F., has been used in the treatment of granular lids; it sets up a purulent conjunctivitis, varying in intensity with the strength and frequency of the applications. A somewhat dangerous remedy. A very strong **infusion**, 1 to 4, was used by Dr. Shoemaker in the treatment of affections of the skin.—*Med. Bulletin*, Nov. 1884; *L.* '85, ii. 733; *L.M.R.* '86, 126; *T.G.* '87, 640; and *L.M.R.* '86, 541. Dr. Martin's researches show that the determining causes of the inflammation and the toxic properties in general are due to a globulin and an albumose, the activity of which it rapidly destroyed by a moist heat of 85° C. (185° F.).

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* Turpeth is the dried Root and Stem of *Ipomœa Turpethum* and is official in the *Ind.* and *Col. Add.* for India and the Eastern and North American Colonies.

Ehrlich has shown that the continuous use of Abrin produces tolerance to its toxicity.—*B.M.J.* '97, ii. 705.

Foreign Pharmacopœias.—Official in Span.

Jequiritol.—A substance allied to Abrin, supplied in sterile solution, containing 50 p.c. of Glycerin. It possesses, when applied locally, a distinctly marked curative action on inflamed conjunctiva; when controlled by Jequiritol Serum, it is the best means for the removal of nebulæ of the cornea.—*L.* '01, i. 1836.

The **root** has been used in many hot countries for the same purpose as liquorice-root, hence it is called Indian Liquorice, but considering the known poisonous character of the seed the title is dangerously misleading.

The **root** and an **extract** prepared from it are official in the Pharmacopœia of India.

Not Official.

JUGLANS.

The Root-bark of *Juglans cinerea* Linn. (Butternut), collected in autumn.

A mild cathartic, used in the form of **Extractum Juglandis**, prepared with Dilute Alcohol, dose, 5 to 10 grains = 0·32 to 0·65 gramme, and **Juglandin**, an eclectic remedy, used in doses of 5 to 10 grains.

Not now official in U.S.

FOLIA JUGLANDIS.—The Leaves of *Juglans regia* L. (Walnut) are Official in Austr., Belg., Ger., Mex. and Span. (Hoja de Nogal); Belg. has also a fluid extract.

FLUIDEXTRACTUM JUGLANDIS.—From the inner bark of the root. Made with Alcohol (49 p.c.), 1 c.c. of fluid extract represents 1 gramme of drug.—*U.S.N.F.* It is used as a cathartic. Average dose.—1 fl. drm. = 3·6 c.c.

SPIRITUS NUCIS JUGLANDIS.—A distilled preparation from the Walnut (*Juglans Regia*).

Aromatic bitter, astringent.

Dose.—1 to 4 fl. drm. = 3·6 to 14·2 c.c.

JUNIPERI OLEUM.

OIL OF JUNIPER.

FR., ESSENCE DE GENIÈVRE; GER., WACHOLDERÖL; ITAL.,
ESSENZA DI GINEPRO.

A colourless, or pale yellow or yellowish-green oily liquid, having a characteristic odour, and balsamic, burning and somewhat bitter taste. It is the Volatile oil distilled from Fruit of *Juniperus communis* Linn. The Fruits should be full-grown and unripe.

It should be kept in well-closed glass bottles of a dark amber tint and protected as far as possible from air and light. The Oil has a tendency to resinify on keeping, and old Oil is more viscid, has an acrid reaction and has a somewhat rancid odour. The solubility is also affected, the Oil becoming less soluble in Alcohol (90 p.c.)

The Oil contains the terpene Pinene, boiling point 156° C. (312·8° F.), the sesquiterpene, Cadinene, boiling point 274° C. (525·2° F.) and Juniper Camphor, and an Ester, boiling point 180° C. (356° F.).

Empyreumatic Oil of Juniper is given under Cadini Oleum, p. 271.

Solubility.—1 in 20 of Alcohol (90 p.c.), but it does not become quite clear; it mixes with equal parts of Absolute Alcohol, but if more Alcohol be added it becomes milky.

Medicinal Properties.—Carminative, anti-spasmodic, and a stimulating diuretic, the latter property constituting its chief medicinal value. Used in cardiac and hepatic dropsical cases, either alone or combined with other diuretics; should not be used in acute Bright's disease.

Dose.—½ to 3 minims = 0·03 to 0·15 c.c.

Official Preparation.—Spiritus Juniperi; contained in Mistura Creosoti.

Not Official.—Spiritus Juniperi Compositus.

Foreign Pharmacopœias.—Official in Austr., Ger. and Jap., sp. gr. 0·865 to 0·880; Norw., sp. gr. 0·860 to 0·870; Hung., sp. gr. 0·840 to 0·900; Fr. (Genièvre) and Ital. (Essenza di Ginepro), sp. gr. 0·865 to 0·885; Port. (Essencia de Zimbro), sp. gr. 0·855 to 0·879; Swiss, sp. gr. 0·860 to 0·885; U.S., sp. gr. 0·860 to 0·880 at 25° C. (77° F.).

Tests.—Juniper Oil has a sp. gr. of 0·865 to 0·895, which figures are increased by exposure to air or by age. It is officially required to dissolve in 4 volumes of a mixture consisting of equal parts of Absolute Alcohol and Alcohol (90 p.c.), but the solubility of the Oil also depends greatly upon the length of time it has been kept. The *B.P.* gives no figures for optical rotation. It is usually lævogyrate, −3° to −12° in a tube of 100 mm. No indication is given in the *B.P.* as to the temperatures at which the various fractions of the Oil should distil. It is in the relative proportion of Pinene to Cadinene that English oils chiefly differ from foreign oils. An English oil examined by Bird (*C.D.* '07, ii. 172) showed a 12 p.c. fraction distilling between 155° to 160° C. (311° to 320° F.), as against 37 p.c. fraction in foreign oil; a 35 p.c. fraction between 160° to 180° C. (320° to 356° F.) as against 34 p.c. fraction in the foreign oil; a 19 p.c. fraction between 180° to 255° C. (356° to 491° F.) as against a 10 p.c. fraction in the foreign oil; and a 22 p.c. fraction at 255° to 280° C. (491° to 536° F.), as against a 10 p.c. fraction in the foreign oil. It has been recommended (*C.D.* '07, ii. 355) that the *B.P.* requirements with regard to fractionation should be, not less than 50 p.c. nor more than 60 p.c., should distil below 165° C. (329° F.), that the refractive index of the unfractionated oil should not be less than 1·4750 at 20° C. (68° F.), and the residue after distilling 80 p.c. should have a refractive index at 20° C. (68° F.) of not less than 1·4900 nor more than 1·4950.

The more generally occurring sophistications are Turpentine Oil, Juniper Wood Oil and Alcohol. Of these, Alcohol is the only one readily detected. It is contained in the first fractions of the Oil, and is identified by the formation of Iodoform on warming this fraction with Potassium Hydroxide Solution and sufficient Iodine Solution to ensure a slight excess. Turpentine Oil is very difficult of detection except when present in large amount.

Preparation.

SPIRITUS JUNIPERI. Spirit of Juniper.

Oil of Juniper, 1; Alcohol (90 p.c.), *q.s.* to yield 20. If not bright, filter through Talc. (1 in 20)

Dose.—20 to 60 minims = 1·2 to 3·6 c.c.

It is two and a half times stronger than *B.P.* '85.

Foreign Pharmacopœias.—Official in Jap., 1 in 50; by weight; U.S., 1 in 20; Austr., Ger. and Swiss, 1 fruit in 4, by distillation; Port. and U.S. have a compound spirit. Not in the others.

Not Official.

SPIRITUS JUNIPERI COMPOSITUS.—Oil of Juniper, 0·4; Oil of Caraway, 0·05; Oil of Fennel, 0·05; Alcohol (95 p.c.) 70; Water, *q.s.* to make 100.—*U.S.P.*

This has been incorporated in the *B.P.C.* using 75 of Alcohol (90 p.c.).

Not Official.

KALADANA.

Syn.—Pharbitis Nil.

The dried Seeds of *Ipomœa hederacea*, Jacq. Cathartic, resembling Jalap in action.

Official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies, as are also the **Compound powder**, Kaladana, 5; Acid Potassium Tartrate, 9; Ginger, 1; dose, 20 to 60 grains = 1·3 to 4 grammes; the **Tincture**, 1 of seeds in 5 of Alcohol (70 p.c.); dose, 30 to 60 minims = 1·8 to 3·6 c.c.; and the **Resin**; dose, 2 to 8 grains = 0·13 to 0·52 gramme.

The Compound Powder, Tincture and Resin have been incorporated in the *B.P.C.*

Not Official.

KAMALA.

Syn.—Glandulæ Rottleræ.

A fine, granular, mobile, brick-red powder, consisting of the minute glands and hairs obtained from the surface of the Fruits of *Mallotus Philippinensis*, Mull. Arg.

Solubility.—Almost insoluble in Water, but about 60 p.c. of a sample (containing 6 p.c. of ash) was soluble in Absolute Alcohol, in Chloroform, and in Ether; and was for the most part soluble in Liquor Potassæ.

Anthelmintic and purgative. Successfully given in tænia, in doses in 30 to 120 grains = 2 to 8 grammes.

Prescribing Notes.—*The powder is usually given suspended in Gruel, Mucilage, Treacle, or Syrup; or it may be prescribed along with Liq. Ext. of Male Fern. A purgative should precede and, if need be, follow.*

Foreign Pharmacopœias.—Official in Austr. and Hung. (10 p.c. of ash), Ger., Ital., Jap., Swed. and Swiss (6 p.c. of ash); Hung. has also Kamala Depuratum; Port., and Russ. (8 p.c. of ash), Mex. Not in the others.

TINCTURA KAMALÆ.—Kamala, 1; Alcohol (60 p.c.), 5.

Dose.—1 to 2 fl. drm. = 3·6 to 7·1 c.c.

KAOLINUM.

KAOLIN.

N.O.Syn.—CHINA CLAY; PORCELAIN CLAY.

A native Aluminium Silicate, powdered, and from which the gritty particles have been removed by elutriation.

A fine white clay, derived from the decomposition of the felspar of granitic rocks; extensive tracts of it occur in Cornwall. When finely ground and washed it is used as a form of Fuller's Earth.

Has been used in Germany for many years as an **excipient for pills** of the easily reducible salts of metals, such as Gold Chloride, Silver Nitrate, and Potassium Permanganate; but a mixture of Paraffins answers better. *See* MASSA PARAFFINUM, p. 863. It is also employed for clarifying Wine, Beer, and Syrups.

Official Preparation.—Contained in Pilula Phosphori.

Not Official.—Cataplasma Kaolini, Unguentum Kaolini and Massa Kaolini.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Ger., Hung., Jap. and Swiss, (Bolus Alba); Dan., Norw., Swed. and U.S., (Kaolinum). Not in the others.

Tests.—Kaolin, when fused with Potassium or Sodium Hydroxide or Carbonate, and the fused product, when cold treated with Water, yields a solution, which, neutralised with Hydrochloric Acid, affords a gelatinous precipitate of Silica, and if the liquid be evaporated to dryness, redissolved in Water, and filtered, the filtered liquid yields with Ammonia Solution a white gelatinous precipitate, insoluble in excess of the reagent, soluble in diluted Hydrochloric Acid. Another portion of the filtrate yields with either Potassium or Sodium Hydroxide Solution a white gelatinous precipitate, soluble in an excess of the reagent. The *U.S.P.* mixes the Kaolin with Water and Sulphuric Acid, evaporates the mixture to dryness, and heats the residue until fumes of Sulphuric Anhydride appear. When the residue is treated with boiling Water and filtered, a grey insoluble deposit of impure Silica remains on the filter. The addition of the Sulphuric Acid to the mixture of Kaolin and Water should cause no effervescence, indicating the absence of Carbonates. The *U.S.P.* includes a test for the absence of more than traces of Iron by mixing 2 grammes of the Kaolin with 10 c.c. of Water and one-quarter of its weight of Sodium Salicylate, and requires that not more than a slight reddish tint shall be produced. The non-volatile residue left on ignition at a red heat should amount to not less than 85 p.c.

Not Official.

CATAPLASMA KAOLINI.—Kaolin, in very fine powder, 577; Boric Acid, 45; Thymol, ½; Methyl Salicylate, 2; Oil of Peppermint, ½; Glycerin, 375; all by weight, *U.S.P.* Heat the Kaolin in a suitable vessel at 100° C. (212° F.) with occasional stirring for one hour, well mix with the Boric Acid, and then incorporate thoroughly with the Glycerin; finally add the Thymol which has been dissolved in the Methyl Salicylate and the Oil of Peppermint, and make a homogeneous mass which should be kept in an air-tight container.

The *U.S. Dispensatory* states that the quantity of Glycerin will be found insufficient for some kinds of Kaolin, and the *B.P.C.* has incorporated this form, making a slight change in the quantity of Kaolin and Glycerin as recommended.

Kaolin, 52·70; Boric Acid, 4·50; Thymol, 0·05; Methyl Salicylate, by weight, 0·20; Oil of Peppermint, by weight, 0·05; Glycerin, by weight, 42·50. Same directions as above, *B.P.C.*

UNGUENTUM KAOLINI.—Soft Paraffin, 1; Hard Paraffin, 1; melt, and add Kaolin, 1; stir till cold.

This has been proposed as a basis for pills containing Silver Nitrate or Potassium Permanganate.—*P.J.* (3) xv. 60.

A very great improvement upon it is the following:—

MASSA KAOLINI.—Soft Paraffin, 2; Hard Paraffin (m.p. 120° F.) 1; Kaolin, 1. This will make a good mass with three times its weight of Potassium Permanganate.

A mixture of Hard Paraffin (m.p. 120° F.), 1; with Soft Paraffin, 1½; answers even better, and will make a good mass with four times its weight of Permanganate. *See* MASSA PARAFFINUM, p. 863.

Both of the above masses have been incorporated in the *B.P.C.*

Not Official.

KAVA-KAVA.

The decorticated, dried and divided Root of *Piper Methysticum*, Forst.

Spinal depressant, causing loss of muscular power; diuretic; used in chronic catarrhal conditions of the genito-urinary organs. Used by the inhabitants of the Polynesian Isles in the preparation of an intoxicating liquor.

Official in the *Ind.* and *Col. Add.* for the Australian Colonies.

An **Extract,** prepared with diluted Alcohol, used as a hypnotic, dose 1 to 5 grains = 0·06 to 0·32 gramme; also a **Fluid Extract** (1 in 1), dose 15 to 60 minims = 0·9 to 3·6 c.c.

An **Extractum Kavæ Liquidum** (1 in 1), dose 30 to 60 minims = 1·8 to 3·6 c.c., is official in the *Ind.* and *Col. Add.* for the Australian Colonies.

Not Official.

KERATIN.

A substance introduced by Dr. Unna for coating pills which are intended to pass the stomach and act in the small intestine. It is made by digesting horn shavings, first in artificial gastric juice (acidified Pepsin solution) until all the albuminous substances have been dissolved, and treating the residue with Ammonia Solution. The ammoniacal solution, when evaporated, yields a gum-like liquid, which can be used for coating pills. The coating, although unaffected by Hydrochloric Acid, is soluble to some extent in Acetic and Citric Acids, which should therefore not be given at the same time.

LIQUOR KERATINI.—Prepared Keratin, 1; Alcohol (90 p.c.), 5; Strong Solution of Ammonia, 5; mix the Alcohol and Ammonia and dissolve the Keratin.

This has been incorporated in the *B.P.C.*

This makes a good coating, and dries quickly. It is better to give the pills a thin coating of Oil of Theobroma, two coatings of Keratin, and then varnish.

KINO.

KINO.

The juice obtained from incisions in the trunk of *Pterocarpus Marsupium*, Roxb., evaporated to dryness. *See* Descriptive Notes below.

Medicinal Properties.—A powerful astringent. Employed in obstinate diarrhœa and dysentery in the form of compound powder or with chalk; also in passive hæmorrhage. Externally as a styptic.

Dose, *in powder*, 5 to 20 grains = 0·32 to 1·3 gramme.

Prescribing Notes.—*Generally given in the form of the* **compound powder;** *it may be administered in the form of* **cachets.** *The Tincture is useful in gargles and tooth-washes, the Lozenge for throat affections.*

Incompatibles.—Mineral Acids, Alkalis and Carbonates, Metallic salts and Gelatin.

Official Preparations.—Pulvis Kino Compositus and Tinctura Kino. Contained in Pulvis Catechu Compositus.

Not Official.—Trochisci Kino.

Foreign Pharmacopœias.—Official in Jap., Port., Swiss and U.S. Not in the others.

Descriptive Notes.—The official Kino is distinguished in commerce as East Indian, Malabar, or Cochin Kino, it being often shipped from that port. It consists of the juice of the tree dried without artificial heat, but the official article is stated to be the juice obtained from incisions in the trunk of Pterocarpus Marsupium evaporated to dryness. But if this implies artificial evaporation, such a drug is not a commercial article. The official drug is in small angular, glistening, reddish-black, brittle, opaque fragments, which in thin splinters have transparent and ruby-red edges. It has no odour, is very astringent, and when chewed tinges the saliva red.

Tests.—Kino is officially stated to be partially soluble in cold Water, and that not less than 80 p.c. should be soluble in boiling Water. Only 88 grains out of 100 grains of Tellicherri Kino are dissolved by cold Water, and 35 grains of Isinglass will precipitate the whole of the astringent matter from the solution. Compared with Pale Catechu it is more soluble in Water, and the solution is more astringent. The *U.S.P.* says slowly soluble in cold Water. The *B.P.* states that it is almost entirely soluble in Alcohol (90 p.c.), and yields little or nothing to Ether; the *U.S.P.* that it is soluble in Alcohol (94·9 p.c.), and nearly insoluble in Ether. The ash varies from 1 to 2 p.c.

Kino Eucalypti (dose, 5 to 20 grains = 0·32 to 1·3 gramme) is official in the *Ind.* and *Col. Add.* for the Australian Colonies.

Butea Gum (Bengal or Madras Kino), the inspissated juice from the stem of *Butea frondosa*, Roxb., is made official in the *Ind.* and *Col. Add.* for use in place of Kino in India and the Eastern Colonies. Kino Eucalypti and Butea Gum have the same uses and doses as E. Indian Kino. It becomes insoluble if long kept.

Butea Seeds and **Powder** of the same are also included for the same countries as an anthelmintic for ascarides, 10 to 20 grains of the Powder.

Waring (*Ph. Ind.*) gives the dose as 20 grains three times a day for three days, and a dose of Castor Oil on the fourth day, but its use requires care.

Preparations.

PULVIS KINO COMPOSITUS. Compound Powder of Kino.

Kino, 15; Opium, 1; Cinnamon Bark, 4. (1 Opium in 20)

Keep it in a well-closed vessel.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

TINCTURA KINO. TINCTURE OF KINO.

Kino, in powder, 2; Glycerin, 3; Distilled Water, 5; Alcohol (90 p.c.), *q.s* to yield 20.

Dose.—$\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Swiss, 1 in 5, by weight; U.S., 1 in 20, *see* below. Not in the others.

Tests.—Tincture of Kino has a sp. gr. of 0·988 to 0·990; contains from 22·0 to 25·0 p.c. w/v of total solids; and about 45 p.c. w/v of Absolute Alcohol. A standard of 5 p.c. w/v of Kinotannic Acid has been proposed (*C.D.* '98, ii. 971) for the Tincture.

As gelatinisation is probably due to an enzyme, the following formula has been proposed: Kino, 2 oz.; Boiling Water, 10 fl. oz. Add the Kino to the Water in a suitable vessel, and maintain the whole at or near the temperature of 100° C. for fifteen minutes, agitating frequently. Allow to cool, replace the Water lost by evaporation, add Alcohol (90 p.c.) 10 fl. oz., and set aside for twelve hours; then strain.—*P.J.* '03, ii. 702.

Rub 5 of Kino and 1 of Purified Talc with 15 of Glycerin and 20 of Distilled Water; transfer to a flask and weigh; heat it on a water-bath for one hour and, after cooling, add Water to make up any loss; then add 65 of Alcohol (95 p.c.), mix and filter through Purified Cotton, and pass through the cotton Alcohol (95 p.c.) *q.s.* to make 100.—*U.S.P.*

Not Official.

TROCHISCI KINO. Containing 2 grains in each lozenge, with Black Currant paste.

This has been incorporated in the *B.P.C.*

Not Official.

KOLA.

The Seeds of *Cola acuminata*, Schott and Endl., a tree whose habitat is the Western Coast of Africa, between Sierra Leone and the Congo. The Seeds contain 2 to 2·5 p.c. of Caffeine, to which it owes its virtues, also a glucoside Kolanin. Kola is official in the *Fr. Codex* (1908) and is required to contain at least 1·25 p.c. of Caffeine; an **Extract** which is required to contain at least 10 p.c. of Caffeine, and a **Fluid Extract,** which is required to contain at least 1·25 p.c. w/w of Caffeine, are also official. A proprietary article is also sold under this name. Various preparations have been made, *i.e.*, **Kola-chocolate, Kola elixir, Kola wafers, Kola wine,** also **Fluid Extract.**

Exerts an energetic action in cases of fatigue on the natives of those parts of Africa where it is indigenous, whereas preparations of Kola made in Europe from the dried nuts are much less active. The fresh nuts and the extract obtained therefrom contain a phenolic compound, Kolatine, which exerts an action entirely different from that of Caffeine, to which the medicinal properties of Kola in fatigue have hitherto been ascribed.—*L.* '06, ii. 177.

Teinture de Cola (1 to 5 of Alcohol 60 p.c.) is official in Fr.; Swiss (Extractum Colæ Fluidum) contains 1·5 p.c. of Caffeine and Theobromine, also (Vinum Colæ) 5 of Fluid Extract and 95 of Vinum Meridianum Austerum; Span., Alcoholic Extract, with Alcohol 70 p.c. (Tintura Alcoholica de Kola), 1 Kola in 10 with Alcohol 70 p.c., and (Vino de Kola) 1 of Kola in 10 of Sherry. All by weight.

B.P.C. has an Extractum Kolæ Liquidum, 1 in 1 using Alcohol (60 p.c.); Elixir Kolæ, 1 of Liquid Extract, $\frac{1}{10}$ of Vanillin and Syrup to produce 100; also Vinum Kolæ, 1 of Elixir of Kola and Detannated Sherry to produce 8.

Descriptive Notes.—Kola nuts are imported from West Africa, and to some extent from the West Indies. The so-called nuts consist of seeds freed from the seed coats, and are sometimes broken up into two cotyledons or into four. These are derived, according to Schumann, from two different species, those having two cotyledons, carmine red when fresh, from *Cola vera*, Schum., and those with four cotyledons, sometimes red and sometimes white when fresh, from *C. acuminata*. The seeds of *C. lepidota*, Schum., are also used by the natives, but there is no evidence that they are exported. The seeds as imported are about 1½ inch (37 mm.) long and 1¼ inch (31 mm.) in diameter, irregularly ovate oblong, with a more or less oblique line where the two cotyledons meet, but those imported from Trinidad and the West Indies are often not much more than half this size. Kola seeds are hard, solid, tough, and of a reddish-brown colour. The taste is earthy and somewhat astringent and slightly bitter.

KOUSSO. *See* CUSSO.

KRAMERIÆ RADIX.

KRAMERIA ROOT.

B.P. Syn.—RHATANY ROOT.

FR., RATANHIA DU PEROU; GER., RATANHIAWURZEL; ITAL., RATANIA; SPAN., RATANIA.

The dried Root of Para Rhatany, a species of Krameria, attributed to *Krameria argentea*, Mart.: or of (2) Peruvian Rhatany, *Krameria triandra*, R. and P.

Medicinal Properties.—A powerful astringent; tonic. Used in chronic diarrhœa; in passive hæmorrhages and mucous discharges, as menorrhagia and leucorrhœa; and generally where Tannin and Catechu are beneficial. The infusion is used as a **gargle** in relaxed sore throat; one teaspoonful of the tincture in a wineglassful of water is an excellent wash for spongy and inflamed gums, or stomatitis due to Mercury. Locally, in form of suppository with Opium or Morphine, it is used in prolapsus ani, anal fissure, and bleeding piles.

Dose.—20 to 60 grains = 1·3 to 4 grammes, in powder.

Incompatibles.—Alkalis, Lime Water, Iron and Lead salts, Gelatin.

Official Preparations.—Extractum Krameriæ, Infusum Krameriæ, Liquor Krameriæ Concentratus, Tinctura Krameriæ, Trochiscus Krameriæ and Trochiscus Krameriæ et Cocainæ. Contained in Pulvis Catechu Compositus.

Not Official.—Extractum Krameriæ Fluidum, Gossypium Krameriæ, Infusum Krameriæ Concentratum, Suppositorium Krameriæ, Syrupus Krameriæ and Trochiscus Krameriæ et Boracis.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Jap. (Rhatany Root), Norw., Russ., Swed. and Swiss (Ratanhia); Mex. (Crameria); Hung. (Ratanha); Ital., Port. and Span. (Ratania); U.S. (Krameria).

Descriptive Notes.—The roots of two species are official in the *B.P.* Peruvian Rhatany, the root of *Krameria triandra*, Ruiz and Pavon, is distinguished by having a large woody crown, often 2 or more in. in diameter, giving off several tapering cylindrical roots. These are tough and not easily broken, of a dark brownish-red colour, the rough bark having a splintery fracture, and readily separating from the woody centre, which is of a yellowish colour. Para Rhatany is derived from *Krameria argentea*, Martius; it consists of cylindrical roots, 12 to 18 in. long and ¼ to ⅓ in. in diameter, has a purplish-brown colour, and smooth thick bark, cracked transversely at intervals, with a short fracture, and adhering closely to the reddish-brown wood. The bark of both kinds is very astringent, and when chewed the root tinges the saliva red, but the woody portion is almost tasteless. The powder of Peruvian Rhatany is lighter in colour than that of the Para drug, and is characterised by conical or pear-shaped starch grains, often arranged in a stellate form or in groups of three or four, by the flattened bast fibres, by the prismatic crystals of Calcium Oxalate in the bast parenchyma, and by the arrangement of bast fibres which, instead of forming extended groups, are dispersed irregularly. Formerly a variety known as Savanilla Rhatany was imported, resembling the Para in appearance, but of a paler purplish tint, and thicker bark, being one-third to a quarter of the thickness of the wood. It can be distinguished by thin sections of the root giving a violet colour when moistened with a ferrous salt, those of the Peruvian sort assuming a greyish hue, and those of Para bluish-black. Savanilla Rhatany is derived from *Krameria tomentosa*, St. Hil. A so-called Rhatany Root from Guayaquil was offered in commerce a few years ago. It contains cluster crystals of Calcium Oxalate, which do not occur in the other kinds of Rhatany mentioned above.

Tests.—Krameria Root contains from 1 to 2 p.c. of ash.

Preparations.

EXTRACTUM KRAMERIÆ. Extract of Krameria. *B.P.Syn.*—Extract of Rhatany.

Prepared from Kameria Root, by exhaustion with Distilled Water and evaporation to dryness.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Jap., Mex., Port., Russ., Span. and U.S.; Hung., crude Extract purified with warm Water; Ital. (aqueous); Swiss, made with boiling Water; Belg., Mex. and U.S. have also a **Fluid Extract.** Not in Ger. or Norw.

INFUSUM KRAMERIÆ. Infusion of Krameria. *B.P.Syn.*—Infusion of Rhatany.

Krameria Root, bruised, 1; boiling Distilled Water, 20. Infuse 15 minutes. (1 in 20)

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.

This Infusion should be freshly prepared, as it deposits when kept.

Foreign Pharmacopœias.—Official in Fr. and Mex., Tisane, 1 in 50. Not in the others.

LIQUOR KRAMERIÆ CONCENTRATUS. CONCENTRATED SOLUTION OF KRAMERIA.

10 of Krameria Root, in No. 40 powder, percolated with Alcohol (20 p.c.), to yield 20. (1 in 2)

Dose.—$\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c.

Tests.—Concentrated Solution of Krameria has a sp. gr. from 1·010 to 1·020; contains about 10 p.c. w/v of total solids; and about 18 p.c. w/v of Absolute Alcohol.

TINCTURA KRAMERIÆ. TINCTURE OF KRAMERIA. *B.P.Syn.*—TINCTURE OF RHATANY.

4 Krameria Root, in No. 40 powder, percolated with Alcohol (60 p.c.), to yield 20. (1 in 5)

In *B.P.* 1885 it was 1 in 8.

Dose.—$\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Swed., Swiss and U.S., 1 in 5. All by weight except U.S. Not in Span.

Tests.—Krameria Tincture has a sp. gr. of 0·930 to 0·940; contains about 5 p.c. w/v of total solids; and about 56 p.c. w/v of Absolute Alcohol.

TROCHISCUS KRAMERIÆ. KRAMERIA LOZENGE. *B.P.Syn.*—RHATANY LOZENGE.

1 grain of Extract of Krameria in each, with Fruit Basis.

Foreign Pharmacopœias.—Official in U.S. Not in the others.

TROCHISCUS KRAMERIÆ ET COCAINÆ. KRAMERIA AND COCAINE LOZENGE. *B.P.Syn.*—RHATANY AND COCAINE LOZENGE.

1 grain of Extract of Krameria and $\frac{1}{20}$ grain of Cocaine Hydrochloride in each, with Fruit Basis.

Not Official.

EXTRACTUM KRAMERIÆ FLUIDUM.—Krameria, in No. 30 powder, 100; Glycerin, 10; Diluted Alchol (49 p.c.), *q.s.* to produce 100.—*U.S.P.* 1890.

This has been incorporated in the *B.P.C.* using Alcohol (45 p.c.)

GOSSYPIUM KRAMERIÆ.—Tincture of Rhatany, $\frac{1}{2}$ fl. oz.; Glycerin, 10 minims; mix and with it saturate evenly Cotton-Wool, 60 grains, and dry.

INFUSUM KRAMERIÆ CONCENTRATUM.—Krameria, in No. 40 powder, 40; Alcohol (90 p.c.), 25; Dilute Chloroform Water (1 to 1000), *q.s.* to make 100. Prepare by repercolation. Before the addition of the Alcohol to the reserved portion, this should be heated to a temperature of not less than 85° C. and maintained thereat for 5 minutes. Dose.—30 to 60 minims = 1·8 to 3·6 c.c. *Farr and Wright*, *P.J.* '06, i. 165, and '07, i. 621; *C.D.* '06, i. 252; *Y.B.P.* 1907, 250.

This appears in the *B.P.C.*

SUPPOSITORIUM KRAMERIÆ.—Extract of Rhatany, 8 grains; Morphine Hydrochloride, $\frac{1}{10}$ grain; Stearin, 10 grains.

Foreign Pharmacopœias.—Official in Fr. and Span., 1 gramme of Extract = 15·5 grains in each.

SYRUPUS KRAMERIÆ.—Fluid Extract of Krameria, 45; Syrup, 55.—*U.S.P.*

This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in Belg., Fluid Extract 1, Syrup 9; Fr., Extract 25, Water 50, Simple Syrup 975, concentrate to 1000 by weight; Ital., Extract 2, Water 5, Syrup 98, concentrate to 100 by weight; Mex., Extract 25, Syrup 975; Swiss, 1 of Extract in 100.

Not Official.

LACHNANTHES TINCTORIA.

A North American plant, known colloquially as Red Root or Spirit Weed, a native of the United States. A homœopathic remedy for checking the cough of phthisis, and for treating pneumonia and typhus. Did not exert any inhibitory action on the progress of tuberculosis, but rather seemed to hasten it.—*B.M.J.* '01, ii. 747, 912, 1124, 1868, 1874; '02, i. 59, 101, 113; '02, ii. 146; *L.* '01, ii. 1605; '02, ii. 72; *Pr.* lxvii. 493; *P.J.* '02, i. 103.

Dose.—2 to 10 minims of a 1 to 10 **Tincture** made with Alcohol (45 p.c.).
A **solid** and a **fluid extract** are also known commercially.

Not Official.

LACTUCA.

Lettuce is the Flowering Herb of the wild indigenous plant, *Lactuca virosa*, L.

Medicinal Properties.—A sedative in irritable cough, either in the form of Extractum Lactucæ or as Lactucarium.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

LACTUCARIUM.—The juice from the incised flower-stalk of *Lactuca virosa* and other species, collected and dried.

Dose.—2 to 6 grains = 0·13 to 0·40 gramme.

Foreign Pharmacopœias.—Official in Dutch, Hung., Mex., Port., Span. and U.S. Not in the others.

SYRUPUS LACTUCARII.—Tincture of Lactucarium, 10; Glycerin, 20; Citric Acid, 0·1; Orange-Flower Water (*U.S.P.*), 5; Syrup, *q.s.* to produce 100. Mix the Tincture with the Glycerin, add the Orange-Flower Water in which the Citric Acid has been previously dissolved, filter if necessary, add the Syrup and make up to 100.—*U.S.P.*

Average Dose.—2 fl. drm. = 7·1 c.c.
This has been incorporated in the *B.P.C.*

TINCTURA LACTUCARII.—Lactucarium, 50; Glycerin, 25; Alcohol (95 p.c.); Purified Petroleum Benzin, Diluted Alcohol (49 p.c.), Water, of each a sufficient quantity to make 100. Powder the Lactucarium with coarse sand and add 200 of Purified Petroleum Benzin, after macerating for 48 hours with frequent agitation pour the mixture on a double filter and allow to drain, wash the residue by gradually adding 150 of Purified Petroleum Benzin, and let the Lactucarium dry by exposure to air. Powder the dried Lactucarium using more sand if necessary, and pack it moderately in a percolator; mix the Glycerin with 20 of Water and 50 of Alcohol (95 p.c.), and moisten the powder with 50 of the mixture and macerate for 24 hours, then let the percolation proceed slowly, gradually adding first the remainder of the menstruum, and then Diluted Alcohol (49 p.c.) until the Lactucarium is exhausted; reserve the first 75 of percolate, evaporate the remainder to 25, mix with the reserved portion, filter, and make up to 100 with Diluted Alcohol (49 p.c.).—*U.S,P.*

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.
This has been incorporated in the *B.P.C.*

TINCTURA LACTUCARII ET OPII.—Official in Mex. Alcoholic Extract of Lactucarium 2, Extract of Opium 1, Alcohol (50 p.c.), *q.s.* to 80.

SYRUPUS LACTUARII ET OPII.—Official in Mex. 1 of the above Tincture in 50.

TROCHISCI LACTUCÆ.—Lozenges containing 1 grain Extract Lettuce in each.

LANOLIN. *See* ADEPS LANÆ.

Not Official.

LARICIS CORTEX.

LARCH BARK.

The Bark of *Larix Europæa*, DC.; collected in the spring, deprived of its outer portion and dried. It contains a volatile crystallisable acid, **Larixinic Acid**, which sublimes in vapour of water.

Medicinal Properties.—Similar to those of Oil of Turpentine. Useful in chronic bronchitis to diminish excessive secretion; the Tincture well diluted forms an astringent injection.

TINCTURA LARICIS.—Larch Bark, 1; Alcohol (90 p.c.), *q.s.* to make 8. (1 in 8)

Dose.—20 to 30 minims = 1·2 to 1·8 c.c.
This has been incorporated in the *B.P.C.*

TEREBINTHINA VENETA or **T. LARICIS** (Venice Turpentine).—A viscid liquid of a yellowish or greenish-yellow colour, obtained from *Larix Europæa*, D.C. It does not readily harden on exposure to air, or when mixed with $\frac{1}{16}$ of Magnesia. Soluble in absolute Alcohol. It is much used on the Continent, and in veterinary practice in this country.

Foreign Pharmacopœias.—Official in Belg., Dutch, Fr. (Térébinthine du Mélèse), Hung., Ital. (Trementina di Venezia), Norw., Port., Russ., Span. (Trementina de Alerce), Swed. and Swiss. Not in the others.

VASOLIMENTUM TEREBINTHINÆ.—Venice Turpentine, 20; Liquid Vasoliment, 80.—*Hager.*

PAROGENUM TEREBINTHINÆ.—Venice Turpentine, factitious, 20; Parogen, *q.s.* to produce 100.—*B.P.C.*

LAUROCERASI FOLIA.

CHERRY-LAUREL LEAVES.

Fr., Laurier Cerise; Ger., Kirschlorbeer; Ital., Lauroceraso;
Span., Laurel-Cerezo.

Descriptive Notes.—The fresh Leaves of *Prunus Laurocerasus*, L., are official. There are about six varieties of the plant in cultivation in this country. The strongest and hardiest is the variety *Caucasica*, which has darker green, thicker and less rounded leaves than the variety *Colchica*, in which they are more obovate, more delicate and paler: the variety *Schipkaensis* has smaller leaves, about the size of those of the bay tree, and forms a small shrub only 3 to 5 feet high. M. Perinelle is of opinion that the variety *Caucasica* should be official, *P.J.* (3) xviii. 170. The Leaves in all the varieties are coriaceous, shining above, but paler beneath where the midrib is prominent, and at the base on each side of the midrib there are one or two glandular depressions. The Leaves are lanceolate oblong, or more or less obovate oblong, 5 to 7 in. long (12½ to 17 cm., *P.B.*) and 1½ to 2 in. wide, attenuated towards either end, or rounded in some varieties, with a slightly revolute margin, with short sharp serratures, and glandular teeth, which are more distant towards the base. The taste is astringent and bitterish. The Leaves are inodorous until bruised, but then immediately emit an odour of bitter almonds and Hydrocyanic Acid; the Leaves can be dried whole and powdered, and still yield Hydrocyanic Acid when the powder is moistened. The glucoside yielding Laurocerasin occurs in the parenchyma of the leaf, and the emulsin in the endodermis of the veins. The Leaves contain the largest amount of Hydrocyanic Acid in July, and the least in February, as much as 2½ p.c. having been found in June in young leaves. Cherry-Laurel Water is liable to vary in percentage of Hydrocyanic Acid, according to the time of year that the Leaves are collected, whether the Leaves are young or fully matured, and also according to the variety employed; the finely-chopped Leaves also yield more Hydrocyanic Acid than if merely bruised.

Official Preparation.—Aqua Laurocerasi.

Foreign Pharmacopœias.—Official in Belg., Dutch, Fr. (Laurier Cerise), Ital. (Lauroceraso), Port. (Loureiro-Cerejeira), and Span. Not in the others.

Dutch has an Oleum Laurocerasi.

Preparation.

AQUA LAUROCERASI. Cherry-Laurel Water.

Fresh Cherry-Laurel Leaves, 16; Water, 50; distil 20, and standardise the distillate to contain $\frac{1}{10}$ p.c. of Hydrocyanic Acid, HCN.

Note.—To ascertain if it lost much of its strength by keeping, a sample was taken which contained 0·104 p.c., and placed in a pint bottle about three-quarters full for a month, it then gave 0·094 p.c.; the bottle was then kept for a week with only 3 oz. in it, and then gave 0·093 p.c.; the same was then kept three days with the cork out, and then gave 0·038 p.c.

It would appear, therefore, that when kept in a closed vessel, the preparation is stable; but, notwithstanding the adoption of an official standard, commercial samples will be found sometimes as low as half the official strength.

Medicinal Properties.—Nervine sedative. Similar to Hydrocyanic Acid, but without the nauseous odour of the Acid. Used as a lotion to allay itching in cutaneous diseases; also as an adjunct to eye lotions (1 or 2 in 16).

Dose.—½ to 2 fl. drm. = 1·8 to 7·1 c.c.

20 minims = 1 minim Diluted Hydrocyanic Acid.

Incompatibles.—Same as Hydrocyanic Acid.

Antidotes.—In case of overdose, the antidotes should be as directed under Acidum Hydrocyanicum Dilutum,' p. 54.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Ital., Span. and Swiss, 1·0 HCN per 1000; Fr., ·55 to ·7 per 1000; Port., Leaves, 1 in 2, not standardised. Not in the others.

The *Brussels Conference* agreed to a strength of 1 per 1000.

Tests.—Cherry-Laurel Water is officially required to contain 0·1 p.c. of absolute Hydrogen Cyanide. The method adopted by the *B.P.* for the determination is a volumetric one, and is described in the large type under 'Acidum Hydrocyanicum Dilutum.' It is to be assumed that a quantity proportionate to the difference in strengths between the two preparations is to be employed, but no statement to this effect appears. The comments made on the process appearing in the large type apply also here. The alternative process there suggested may be employed for this assay, using 50 c.c. of the Water.

LAVANDULÆ OLEUM.

OIL OF LAVENDER.

FR., ESSENCE DE LAVANDE; GER., LAVENDELÖL; ITAL., ESSENZA DI LAVANDA; SPAN., ESENCIA DE ESPLIEGO.

A pale yellow, or yellowish-green, oily liquid, having a pleasant characteristic odour, and an aromatic and somewhat bitter taste. It is the volatile Oil distilled from the Flowers of *Lavandula vera*, DC.

It should be kept in well-closed glass bottles of dark amber tint in a cool atmosphere, and it should be protected as far as possible from the light.

The principal constituents are an Alcohol **Linalool**, $C_{10}H_{18}O$, eq. 152·98, identical with that obtained from Lignum Aloes, and its Acetic Ester (Linalyl Acetate), which also forms the principal constituent of Oil of Bergamot.

It contains also the terpenes, Pinene and Limonene, a second Alcohol, Geraniol, and a sesquiterpene. English Oil of Lavender contains from 7 to 10 p.c. of Esters calculated as Linalyl Acetate ($C_{10}H_{17}O \cdot C_2H_3O$, eq. 194·68), whilst the French Oils contain from 25 to 50 p.c. Cineol is also present to a greater extent in the English than in the foreign oils. Gildemeister and Hoffmann state that the value of Lavender Oil depends on its content of Linalyl Acetate, but Parry, in common with most others, is of opinion that no comparison between the oils can be made on the basis of their Ester content, Linalyl Acetate not being the sole odoriferous constituent of Lavender Oil. Coumarin has been detected in French Lavender Oil.

It is sometimes adulterated with the foreign Oil of *L. vera*, DC., and the foreign Oil is frequently adulterated with Oil of Spike from *L. spica*, DC. The flavour is stated to be improved by keeping for a year after distillation, and then mixing with an equal volume of Absolute Alcohol.

Solubility.—In all proportions of Alcohol (90 p.c.) and Absolute Alcohol; sparingly soluble in Alcohol (60 p.c.).

Medicinal Properties.—An aromatic gastric stimulant and carminative. Useful in flatulence and colic.

Dose.—½ to 3 minims = 0·03 to 0·12 c.c.

Prescribing Notes.—*The* **oil** *is rarely given alone, it is used as an adjuvant to other medicines. Small doses of the* **spirit** *are given on Sugar. The* **Compound Tincture** *is a favourite colouring for mixtures.*

Official Preparations.—Of the **Oil**, Spiritus Lavandulæ, and Tinctura Lavandulæ Composita. Contained in Linimentum Camphoræ Ammoniatum. The Compound Tincture is contained in Liquor Arsenicalis.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Ger., Norw. (Ætheroleum Lavandulæ), Ital. (Essenza di Lavanda), Russ., and Swed., sp. gr. 0·885 to 0·895; Dutch, sp. gr. 0·880 to 0·890; Fr., sp. gr. 0·882 to 0·895; Hung. and Jap., sp. gr. 0·885 to 0·900; Port. (Essencia de Alfazema), sp. gr. 0·875 to 0·940; Span. (Esencia de Espliego), sp. gr. 0·87 to 0·94; Swiss, sp. gr. 0·882 to 0·895; U.S., sp. gr. 0·880 to 0·892 at 25° C. (77° F.).

Tests.—Lavender Oil has a sp. gr. of 0·885 to 0·895, the official requirement is not below 0·885, the *U.S.P.* 0·875 to 0·910 at 25° C. (77° F.); the *P.G.* 0·885 to 0·895. The optical rotation in a tube of 100 mm. is from −3° to −10°. It is officially required to dissolve in 3 times its volume of Alcohol (70 p.c.), which corresponds with the requirements of the *U.S.P.* The *P.G.* specifies Alcohol (68 to 69 p.c.) and the parts refer to parts by weight. All specimens of Lavender Oil will not yield a clear solution with 3 to 3½ volumes of the weaker strength Alcohol of the *P.G.* Neither the *B.P.* nor the *U.S.P.* includes a process for the determination of the Ester content. The *P.G.* volumetric determination expressed in terms of Linalyl Acetate indicates at least 29·5 p.c. A standard of not more than 11 p.c. of Linalyl Esters has been suggested (*Y.P.B.* '03, 248) and not less than 36 p.c. for the French Oils.

The more generally occurring sophistications are Turpentine Oil, Spike Oil, Spanish Lavender Oil, Rosemary Oil, and Alcohol. Turpentine Oil lowers the sp. gr. and effects the rotation according to whether the Turpentine Oil used as the adulterant is dextrorotatory, *e.g.*, American Turpentine Oil, or lævorotatory, *e.g.*, French Turpentine Oil. Spike Oil increases the sp. gr. and lowers the rotation. Spanish Lavender Oil behaves in a similar manner. Rosemary Oil increases the sp. gr. and lowers the rotation, but renders the Oil less soluble.

Various substances, *e.g.* Ethyl Succinate, Benzoic, Oxalic and Salicylic Acids, have from time to time been added to the oil with a view to masking adulteration by artificially raising the Ester-content. The presence of Ethyl Succinate and Benzoic and Oxalic Acids may be determined by saponifying a weighed quantity of 2 grammes of the Oil with Potassium Hydroxide Solution, neutralising with Acetic Acid, diluting to 50 c.c. and adding 10 c.c. of saturated Barium Chloride Solution. The mixture is warmed for 2 hours on the water-bath and allowed to cool. The formation of a crystalline precipitate indicates adulteration. Salicylic Acid may be detected by the purple-violet coloration produced on the addition of Ferric Chloride T.S. after saponification and by the m.p. of the isolated acid. The presence of Benzoic Acid may be confirmed by Ferric Chloride T.S. and the m.p. of the isolated acid. The presence of Alcohol may be determined by a diminution in volume when the Oil is shaken with Water.

Adulteration with Glycerin Monacetate has also been noticed. Such adulteration may be detected by shaking the suspected oil with 4 to 5 volumes of Petroleum Ether, in which the Glycerin ester is insoluble, and Glycerin may be further identified by the Acrolein reaction.

Water.—When the Oil is shaken with Water in a narrow graduated cylinder its volume should not be diminished (absence of Alcohol), *U.S.P.*

Volumetric Determination.—If 1 gramme of the Oil be heated in a reflux condenser with 10 c.c. of Semi-normal Volumetric Alcoholic Potassium Hydroxide Solution for half an hour on a water-bath, and after cooling and the addition of a few drops of Phenolphthalein T.S., the mixture be titrated with Semi-normal Volumetric Hydrochloric Acid Solution, at most 7 c.c. of the Acid should be necessary to discharge the colour, *P.G.*

Preparations.

SPIRITUS LAVANDULÆ. SPIRIT OF LAVENDER.

Oil of Lavender, 1; Alcohol (90 p.c.), *q.s.* to yield 10. (1 in 10)

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

It is 5 times the strength of *B.P.* '85.

Foreign Pharmacopœias.—Official in Russ., 1 in 100; Dan. and Swed., 2 in 100; Jap., 3 in 100; U.S., 5 in 100; all with the Oil, and all by weight except U.S. Austr., Dutch, Ger., Ital. and Swiss, all 1 in 4, and Port. 1 in 2, from the flowers. Not in the others.

Tests.—Spirit of Lavender has a sp. gr. of 0·835 to 0·838, and contains about 68 p.c. w/v of Absolute Alcohol.

TINCTURA LAVANDULÆ COMPOSITA. COMPOUND TINCTURE OF LAVENDER.

Oil of Lavender, 45 minims; Oil of Rosemary, 5 minims; Cinnamon Bark, bruised, 75 grains; Nutmeg, bruised, 75 grains; Red Sanders Wood, 150 grains; Alcohol (90 p.c.), 20 fl. oz. By maceration, adding the Oils at the finish.

Dose.—$\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c.

Tests.—Compound Tincture of Lavender has a sp. gr. of 0·835 to 0·840; contains about 0·5 p.c. w/v of total solids and about 88·0 p.c. w/v of Absolute Alcohol.

Foreign Pharmacopœias.—Official in Swed., Tinctura Lavandulæ aromatica, Oil of Lavender 2, Oil of Rosemary 1, Saigon Cinnamon 8, Red Sanders Wood 8, Myristica 8, Alcohol (64 p.c.) 800. U.S., Tinctura Lavandulæ Compositum, Oil of Lavender Flowers 8, Oil of Rosemary 2, Saigon Cinnamon 20, Cloves 5, Myristica 10, Red Sanders 10, Alcohol and Water, each, a sufficient quantity to make 1000. Jap., Tinctura Lavandulæ Compositum similar to U.S.

Not Official.

LEPTANDRA.

CULVERS ROOT.

The Rhizome and Rootlets of *Veronica Virginica*, L.

A cathartic, and stimulates the flow of bile.

An Alcoholic **Extract,** average dose, 0·25 gramme (4 grains), and **Fluid Extract** (1 in 1), average dose, 1 c.c. (15 minims), are both official in U.S.

Leptandrin.—An eclectic remedy, used as an alterative, $\frac{1}{4}$ to $\frac{1}{2}$ grain = 0·016 to 0·032 gramme; as a purgative, 2 to 4 grains = 0·13 to 0·26 gramme.

LIMONIS CORTEX.

LEMON PEEL.

Fr., Ecorce de Citron; Ger., Citronenschale; Ital., Scorza di Limone; Span., Limon.

The fresh outer part of the pericarp of the Fruit of *Citrus Medica*, L., var. *Limonum*, Hook. f.

Commercially the peel is cut in December, and is more readily obtainable at that time.

Ind. and *Col. Add.* authorises the use of **Dried Lemon Peel** in India and the Colonies, when Fresh Lemon Peel is not obtainable.

Medicinal Properties.—Bitter stomachic and tonic. Added to stomachic medicines. Chiefly used, however, to impart flavour to other medicines.

Official Preparations.—Of the **peel**, Oleum Limonis, Syrupus Limonis and Tinctura Limonis. Used in the preparation of Infusum Aurantii Compositum and Infusum Gentianæ Compositum. The **oil** is contained in Linimentum Potassii Iodidi cum Sapone, Spiritus Ammoniæ Aromaticus, Tinctura Guaiaci Ammoniata and Tinctura Valerianæ Ammoniata.

Not Official.—Terpeneless Oil of Lemon, Citral.

Foreign Pharmacopœias.—Official in Fr. (Citron), Ger., Hung., Ital. (Cedro and Limone) Jap., Port. (Limao), Russ., Swiss and U.S. Not in the others.

Descriptive Notes.—Only the fresh peel is official. On its inner surface there should be only a small amount of the white spongy portion of the rind. In the *P.G.* the rind, separated in spiral strips and dried, is official. The larger rough, thick-skinned fruits of *Citrus Medica*, L., the citron or cedrat of the French, are sometimes sold as lemons, but are rather less fragrant and contain less juice. These are usually imported in July and August. Lemons vary much in flavour, the Messina lemons having the purest lemon flavour, these of Palermo having a slight additional musk and verbena odour; these and the Murcia lemons, which have a particularly fine flavour and are sometimes very large, weighing from 12 to 19½ oz., a large one yielding 2½ oz. of peel, reach England from November to April. A box of Messina Lemons contains 300 to 360 fruits; a box of Murcia Lemons only 200. Naples lemons are imported from April to August, but are inferior to the Sicilian kinds. Malaga lemons, which have thick skins and numerous seeds, and proportionately less juice, arrive in September and October. Lemons should be chosen with a thin rind and of medium size, as they are richer in juice and are likely to keep better, the rind having been reduced in thickness by a process of curing or drying before packing, thus rendering them less likely to become mouldy.

Tests.—Lemon Peel yields not more than 5 p.c. of ash.

Preparations.

OLEUM LIMONIS. Oil of Lemon.

Fr., Essence de Citron; Ger., Citronenöl; Ital., Essenza di Cedro; Span., Esencia de Limon.

The Volatile Oil obtained from fresh Lemon Peel. A light yellow liquid with a pleasant odour and an aromatic, mild, somewhat bitter after-taste.

The Oil consists of about 90 p.c. of the terpenes Dextro- and Lævo-Limonene, the Dextro-Limonene being the more important.

The terpene Phellandrene is also present in small quantity in the Oil. Pinene is not present. The odour and flavour of the Oil are dependent upon the oxygenated bodies, and are due chiefly to the aldehyde of Geraniol, Geranaldehyde, $C_{10}H_{16}O$, eq. 150·98, which is known commercially as Citral, and which is present to the extent of 3 to 4 p.c. *See* under Tests. A second aldehyde, Citronellal, is also present. An ester of Geraniol (Geranyl Acetate) is present in the Messina and Palermo Oils, whilst the latter Oil contains also a Linalyl ester (Linalyl Acetate), to which the difference in odour between the Palermo and Messina Oils has been partly attributed. A very small quantity of a sesquiterpene boiling at 240° to 242° C. (464° to 467·6° F.) is present. Octyl and Nonyl aldehydes have been detected in Lemon Oil and also Methyl Heptenone, Anthranilic Acid Methyl-Ester, Citraptene and a Resin. Octyl and Nonyl aldehydes must be regarded as important constituents, as they play an important part in the aroma of the Oil. *See* also Citral.

Its flavour and aroma suffer much from keeping; it keeps the aroma much better if mixed (when fresh) with 10 p.c. (by measure) of Absolute Alcohol. The presence of Ethylic Alcohol can readily be detected by the diminution in volume of the Oil on shaking with Water. The Oil should evaporate from paper without leaving a stain.

Solubility.—In all proportions of Glacial Acetic Acid and Absolute Alcohol; 1 in 12 of Alcohol (90 p.c.).

Dose.—$\frac{1}{2}$ to 3 minims = 0·3 to 0·18 c.c.

Foreign Pharmacopœias.—Official in Austr., Oleum Citri, Belg., Essentia Citri, Dan., Ætheroleum Citri, Ger. and Jap., Oleum Citri (sp. gr. 0·858 to 0·861); Dutch (sp. gr. 0·850 to 0·860), Hung. (sp. gr. 0·840 to 0·870), Russ. (sp. gr. 0·855 to 0·865), and Swiss (sp. gr. 0·857 to 0·861), all Oleum Citri; Ital., Essenza di Cedro (sp. gr. 0·857 to 0·860); Fr., Essence de Citron (sp. gr. 0·857 to 0·862); Mex., Aceite Volatil de Limon (sp. gr. 0·849); Norw. (sp. gr. 0·850 to 0·865) and Swed. (sp. gr. 0·855 to 0·861), Ætheroleum Citri; Port., Essencia de Limao, (sp. gr. 0·846 to 0·856); Span., Esencia de Limon (sp. gr. 0·852 to 0·856); U.S., Oleum Limonis (sp. gr. 0·851 to 0·855 at 25° C. (77° F.)).

Tests.—Lemon Oil is officially required to possess a sp. gr. of 0·857 to 0·860; the *U.S.P.* requires 0·851 to 0·855 at 25° C. (77° F.), and the *P.G.* 0·858 to 0·861. The sp. gr. of the Oil is usually 0·856 to 0·858 and occasionally 0·860. The optical rotation is from + 58° to + 63° in a tube 100 mm. in length. The official figure is not less than + 59°. The *U.S.P.* required that its optical rotation should not be less than + 60° at a temperature of 25° C. (77° F.); this minimum rotation figure was considered too high, and with the 1907 season's Oil was virtually unattainable. The figure was altered in the list of Additions and Corrections (1907) to not less than +58°. The *P.G.* does not include a rotation figure. The refractive index of the Oil is not included in either the *B.P.*, *U.S.P.* or *P.G.*

It is from 1·473 to 1·483. Neither the *B.P.* nor *P.G.* requires the Oil to contain any definite percentage of Geranaldehyde (Citral), and no method of determination is given. The *U.S.P.* requires that it shall yield not less than 4·0 p.c. of aldehyde calculated as Citral, when quantitatively determined by means of the following volumetric process, which is based upon the interaction of the aldehyde and a neutral 20 p.c. w/v Sodium Sulphite Solution, whereby Citral Dihydrosulphonic Acid is produced and a corresponding amount of Sodium Hydroxide is liberated, which is determined by titration with Semi-normal Volumetric Hydrochloric Acid Solution, using Rosolic Acid Solution as an indicator of neutrality. A control experiment with the reagents alone, without the Lemon Oil, is carried out simultaneously, the number of c.c. of Semi-normal Volumetric Acid required in this blank experiment being deducted from the number obtained in the actual determination. 1 c.c. of Semi-normal Volumetric Hydrochloric Acid Solution corresponds to 0·03802 gramme of Citral. Great diversity of opinion exists amongst authorities on essential oils, not only with regard to the actual amount of Citral contained in genuine Lemon Oils, but also with regard to the relative reliability of the various processes which have been suggested from time to time for its determination. The balance of opinion (more particularly amongst English authorities) appears to be that the standard of 5 to 7 p.c. of Citral cannot be maintained, and that the true percentage is nearer 3 to 4 p.c. Leaving chemical considerations out of the question altogether, Terpeneless oils are found to contain about 50 p.c. of Citral, which should mean that the yield of Terpeneless oil from Oil of Lemon should be about 14 p.c., whereas the manufacturers find that not more than half this amount is obtained. The determination of the aldehyde by the direct measurement of the portion unabsorbed by Sodium Bisulphite Solution is most conveniently carried out by mixing a measured quantity of 50 c.c. of the Oil with 75 c.c. of a 40 p.c. w/v Sodium Metabisulphite Solution and 25 c.c. of Sodium Sulphite (made by exactly neutralising the Sodium Bisulphite Solution with a 10 p.c. w/v Sodium Hydroxide Solution). The mixture is heated to 70° C. (158° F.) and shaken for one hour. Sufficient Water is then added to bring the Oil into the graduated portion of the flask and the unabsorbed portion is read off, a correction being made for the solubility of the Terpenes. This method has been adversely criticised, but is stated to give approximate results. The Hydroxylamine process has been found to give totally unreliable results. The Cyanacetic Acid method yields results which are invariably too high, and is useless when small percentages of Citral are concerned. The volumetric process with Sodium Bisulphite Solution (Sadtler's process), virtually that adopted by the *U.S.P.*, is referred to above. Messrs. Schimmel have adversely criticised the process, stating that the clearness of the end reaction leaves something to be desired.

A method somewhat similar to Sadtler's process has been recommended (*C.D.* '05, ii. 408) for the determination of Citral. It is based on the reaction of Citral with Potassium or Sodium Sulphite

Solution containing sufficient excess of the Hydrogen Sulphite for the solution to remain acid after the absorption. The solution is prepared by dissolving 400 grammes of crystallised Potassium or Sodium Sulphite in 1 litre of Water and adding sufficient Potassium or Sodium Hydrogen Sulphite Solution to make each 25 c.c. sufficiently acid to neutralise 20 c.c. of Semi-normal Potassium Hydroxide Solution. A measured quantity of 5 c.c. of the Oil is heated with sufficient of this solution in a closed flask for three hours on the water-bath and the residual acid is then titrated. Three molecular equivalents of acid are equivalent to one molecular equivalent of Citral, and consequently 1 c.c. of Semi-normal Volumetric Potassium Hydroxide Solution corresponds to 0·02516 gramme of Citral. The process has been criticised by Messrs. Schimmel in their semi-annual report, October to November, 1905; they find the process open to the same objection as Sadtler's process, viz., the indefinite nature of the end reaction, and did not succeed in the preliminary neutralisation of the solution as directed.

The more generally occurring adulterants of Lemon Oil are Turpentine Oil, Lemon Oil terpenes, Turpentine Oil to which Lemon Grass Oil Citral has been added, Turpentine Oils plus the addition of a little inferior Orange Oil, and Cedarwood Oil. Turpentine Oil is readily detected by distilling and examining the first 10 p.c. of distillate. This distillate is required to possess a rotation differing by not more than 2° from that yielded by the original Oil. This limit is considered very severe, genuine Lemon Oils often showing a greater difference. Lemon Oil terpenes are very difficult to detect. Their presence may be ascertained by fractional distillation and the determination of the optical rotation of fractions, and also by the reduction in the Citral content. To meet the reduction in Citral strength caused by the addition of Lemon Oil terpenes, Citral from Lemon Grass Oil has been added. It may be detected by the marked verbena odour communicated to the residue after about 90 p.c. of the Oil has been distilled off *in vacuo*. A method of fractional distillation, which it is claimed will show any adulteration, is given (*J.S.C.I.* '01, 1179). A measured quantity of 100 c.c. of the Oil is put into a distilling flask having three bulbs blown in the neck, and fitted with a cork and thermometer. It is connected with a condenser, fitted with a suitable receiver, having two vessels graduated at 10 c.c. and 80 c.c. respectively. It is exhausted, a pressure of not more than 15 mm. being maintained. The flask is gently heated by means of an oil-bath. The first 10 c.c. should not take more than seven minutes to distil. The next vessel is put into position, and the distillation continued until 80 c.c. have distilled over. The pressure is then relieved, and the residual oil in the flask is distilled over with steam, and the quantity obtained carefully noted. The optical rotation and the refractive indexes of the three fractions are determined, respectively, by the polariscope and Zeiss refractometer.

Turpentine Oil may be detected by the optical rotation, the diminution in the percentage of aldehydes, the effect upon the solubility of the Oil in Alcohol, and an examination of the portion unabsorbed by Sodium Bisulphite. The presence of Citral from Lemon Grass Oil may be ascertained by a determination of the optical rotation and the marked verbena odour of the absorbed aldehydes.

The method adopted by Burgess and Child for ascertaining the solubility of a Terpeneless oil, and to which they refer as the solubility number, is to dissolve a measured quantity of 1 c.c. of the Oil in 20 c.c. of Alcohol (94 p.c.), and then to add, from a burette, Distilled Water until a permanent milkiness ensues; the solubility number is the number of c.c. of Water required to produce such turbidity.

SYRUPUS LIMONIS. Syrup of Lemon.

Fresh Lemon Peel, in thin slices or grated, 1; Alcohol (90 p.c.), a sufficient quantity; Lemon Juice, 25; Refined Sugar, 38. Macerate the Lemon Peel in 1½ of the Alcohol for seven days; press; filter; add sufficient of the Alcohol to produce 2. In the Lemon Juice, clarified by subsidence, dissolve the Refined Sugar by the aid of gentle heat. When the resulting syrup is cold, mix with it the 2 of Alcoholic liquid. The product should weigh 65.

(1 of Peel and 25 of Juice in 65)

This makes a turbid syrup. It is not possible to completely clarify it by subsidence. It has been suggested to filter the juice through Talc, but this removes not only the turbidity but also some of the flavour. It does not filter readily through flannel or paper, but if the juice is heated nearly to 212° F. (100° C.) and strained through flannel before dissolving the sugar, the resulting syrup is bright and clear.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Fr. (Sirop d'Acide Citrique) Citric Acid, 1; Simple Syrup, 97; Alcoolature de citron, 2; Ital., Bruised Peel 2, Sugar 19, Distilled Lemon Water 12; Mex. (Jarabe de Limon), Lemon Juice 10, Syrup 100; Port. (Xarope de Casca de Limao), Fresh Lemon Peel 1, Boiling Water 35, Sugar 65; Span. (Jarabe de Limon), Lemon Juice 5, Sugar 9; and Swiss, Citric Acid 2, Water 2·5, Syrup 94, Spirit of Lemon 1·5. For other Pharmacopœias, *see* Acidum Citricum.

TINCTURA LIMONIS. Tincture of Lemon.

Macerate 5 of Fresh Lemon Peel with 20 of Alcohol (90 p.c.)
Now 1 in 4, *B.P.* 1885 was 1 in 8.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Belg. (Spiritus Citri), 1 Oil in 100; Dutch (Spiritus Citri), 4 of Fresh Peel in 10 (distilled); Fr. (Alcoolature de Citron), 1 Fresh Peel to 2 of Alcohol; Jap. (Spiritus Citri), 1 Oil in 10; Mex. (Alcoholato de Cortezas de Limon), Fresh Peel 2, Alcohol (80°) 10, Water 2, distil; Span. (Alcohol de Corteza de Limon), Peel 1, and Alcohol (80 p.c.) 6, distil; Swiss (Spiritus Citri), 12 of Fresh Peel in 100 (distilled); U.S. (Tinctura Limonis Cortex), Fresh Lemon Peel 1, Alcohol (95 p.c.), to produce 2. *B.P.C.* (Tinctura Limonis Fortis), Fresh Lemon Peel 1, Alcohol (90 p.c.) 1.

Tests.—Tincture of Lemon has a sp. gr. of 0·875 to 0·880; contains from 1 to 2 p.c. w/v of total solids and about 76 p.c. w/v of Absolute Alcohol.

Not Official.

TERPENELESS OIL OF LEMON.—A Terpeneless Oil of Lemon is an Oil from which practically the whole of the terpenes have been removed. When carefully prepared it is free from Limonene and contains very little of the Stearoptene of the original Oil. The relative yield of the Terpeneless Oil is about 4 to 6 p.c. The Oil contains about 50 p.c. of Geranaldehyde (Citral) together with Citronellal, Geranyl Acetate, and Linalyl Acetate. Octyl and Nonyl Aldehydes, which are important constituents of Lemon Oil, acquire an additional importance in the Terpeneless Oil, on account of the modification they effect in the aroma and flavour of the Oil. Anthranilic Acid Methyl-Ester also forms a constituent of the Oil.

Tests.—Terpeneless Lemon Oil has a sp. gr. of 0·895 to 0·899, an optical rotation in a 100 mm. tube of $-5°$ to $-8°$, a refractive index in a Zeiss refractometer of 1·481 to 1·482.

The percentage of Geranaldehyde (Citral) should amount to not less than 40 p.c. nor more than 50 p.c. It may be determined by measuring the unabsorbed portion of the Oil after treatment with Sodium Bisulphite, or by the Sodium Sulphite method. Both processes are described in the large type under 'Oleum Limonis.'

The Oil may contain Terpenes, due to imperfect separation or intentional adulteration, and Lemon Grass Oil Citral.

OLEUM GRAMINIS CITRATI. Oil of Lemon Grass. *Syn.* Indian Oil of Verbena.—The Oil distilled from *Andropogon Citratus*, dose ½ to 3 minims = 0·03 to 0·18 c.c., is official in the *Ind.* and *Col. Add.* for India, the Eastern Colonies and the West Indian Colonies.

CITRAL. GERANIAL. $C_{10}H_{16}O$, eq. 150·98.—A pale, yellow, mobile, optically inactive Oil, consisting of the high boiling point fractions from the distillation of Lemon Oil, having a penetrating lemon odour, and possessing a flavouring power about 15 times as great as the original Oil.

Sp. gr. 0·895 to 0·899; boiling point, 228° to 229° C.

It gives the aldehyde reactions with Bisulphites, and on reduction yields the alcohol **Geraniol.**

It may be used to increase the flavour of Oil of Lemon, by mixing it with the latter in the proportion of 1 to 14.

Teinture d'Essence de Citron Composée (Eau de Cologne).—Oil of Bergamot, 10; Oil of Orange, 10; Oil of Lemon, 10; Oil of Orange Flower, 2; Oil of Rosemary, 2; Alcohol (90 p.c.), 1000.—Fr.

LIMONIS SUCCUS.

LEMON JUICE.

FR., SUC DE CITRON; GER., CITRONENSAFT; ITAL., SUCCO DI LIMONE; SPAN., ZUMO DE LIMON.

The freshly expressed Juice of the ripe Fruit of *Citrus Medica* var. *Limonum.* Contains 30 to 40 grains of Citric Acid to the fl. oz. It varies with the time of year. The acidity decreases as the season advances from November to April.

Lemon Juice is extremely liable to fermentation, and requires the addition of Alcohol to keep it; about 15 p.c. of Proof Spirit is sufficient.

Medicinal Properties.—Refrigerant; when diluted, a particularly useful beverage in prevention and treatment of scurvy (3 or 4 oz. daily); relieves thirst in febrile and inflammatory affections. In acute rheumatism, ½ to 1 pint = 284 to 568 c.c. daily.

Dose.—1 to 2 fl. oz. = 28·4 to 56·8 c.c.

Official Preparation. Syrupus Limonis, p. 726. Used in the preparation of Acidum Citricum.

Foreign Pharmacopœias.—Official in Dutch (Succus Citri Artificialis), Citric Acid 1, Water 8, Spirit of Lemon 1; Fr.; Mex. (Jugo de Limones); Span. (Zumo de Limon); U.S., from 7 to 9 p.c. of Citric Acid; Swiss (Succus Citri facticius), Citric Acid 10, Water 89, Spirit of Lemon 1.

Tests.—Lemon Juice has a sp. gr. of 1·030 to 1·040; contains from 10 to 14 p.c. w/v of total solids, and when evaporated to dryness and ignited leaves not more than 3 p.c. w/v of ash.

It is officially required to contain from 7 to 9 p.c. w/v of Citric Acid, equivalent to from 30 to 40 grains per fl. oz. The acidity may be conveniently determined by titrating 10 c.c. of the juice with Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality; about 10·1 c.c. will be required, 1 c.c. of Volumetric Sodium Hydroxide Solution = 0·0695 gramme of Citric Acid. The *U.S.P.* requires that 10 c.c. of the juice shall neutralise at least 10 c.c. of Normal Volumetric Potassium Hydroxide Solution, using Phenolphthalein Solution as an indicator. This corresponds to 6·95 p.c. of Citric Acid. Lemon Juice is not official in the *P.G.*

No official tests are given for impurities. It should evolve no odour of Sulphurous Acid when warmed. When neutralised with Potassium Hydroxide Solution, then rendered faintly acid with diluted Hydrochloric Acid and shaken with Ether, the ethereal solution, when washed with a few c.c. of Water, should yield no purple-violet coloration when shaken with Water containing a drop of Ferric Chloride T.S., showing the absence of Salicylic Acid. Barium Chloride Solution added to the filtered juice should cause no turbidity or precipitate. This test for Sulphuric Acid and Sulphates is included in the *U.S.P.*, as well as the following for Acetic and Tartaric Acids respectively. When warmed with an equal volume of Sulphuric Acid and a few drops of Alcohol (94·9 p.c.) it should not evolve an odour of Ethyl Acetate (Acetic Ether). Upon the addition of a 1 in 3 Potassium Acetate Solution, and Alcohol (94·9 p.c.) in excess, it should not yield a white crystalline precipitate of Potassium Hydrogen Tartrate.

100 c.c. of average Lemon Juice require for neutralisation about 11·4 grammes of Potassium Bicarbonate, about 9·5 grammes of Sodium Bicarbonate, and about 16·5 grammes of Sodium Carbonate, or, if the Imperial quantities are adopted, 110 minims require for neutralisation about 11½ grains of Potassium Bicarbonate, about 9½ grains of Sodium Bicarbonate, and about 16½ grains of Sodium Carbonate.

ACIDUM CITRICUM.—*See* ACIDUM CITRICUM.

LINUM.

LINSEED.

FR., LIN; GER., LEINSAMEN; ITAL., LINO; SPAN., LINO.

The dried ripe Seeds of *Linum usitatissimum*, L.

The envelope or testa abounds in a peculiar gummy matter or mucilage, readily imparted to hot Water.

Medicinal Properties.—Demulcent. Employed in faucal, pharyngeal and bronchial catarrh, dysentery, diarrhœa, and inflammatory affections of the urinary passages. In the form of Linseed Poultice it is applied to inflamed parts.

Official Preparations.—Linum Contusum and Oleum Lini.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Fr. (Lin), Ger., Hung., Ital., Jap., Mex. (Linaza), Norw., Port. (Linho), Russ., Span. (Lino), Swed., Swiss and U.S.

Descriptive Notes.—Linseed varies much in size, the varieties imported from subtropical countries being distinctly larger than those cultivated in temperate or cold climates. Thus, of Russian, Dutch, English, and ordinary Calcutta Linseed, twelve or fourteen seeds, and of Archangel Linseed even seventeen seeds, weigh one grain; whilst of Bombay, Sicilian, and Ionian Linseed six or seven only are equal to a grain in weight; in other words, the last three are almost twice the size of the Linseed of temperate climates. For use in medicine the English and Dutch Linseeds are to be preferred, since they are usually most free from weed seeds, and from dirt. Most of the different varieties contain weed seeds distinctive of the country where they are produced, and can be recognised by these seeds, but any samples of Linseed containing more than 4 p.c. of weed seeds may be considered to be adulterated. Official Linseed is stated to be $\frac{1}{6}$ to $\frac{1}{4}$ in. in length (4 to 6 mm.), (3 to 5, *U.S.P.*), ovate and somewhat obliquely pointed, the surface glabrous and minutely pitted; of a brown colour, inodorous; with a mucilaginous taste. The mucilage exists in the epidermal cells, and is formed at the expense of starch, which is found only in the young seed in these cells. The seeds contain about one-tenth of their weight of mucilage (6 p.c. Vogl), which can be precipitated in white flakes by Alcohol, but cannot be filtered until after boiling. Russian Linseed is largely used for the manufacture of Linseed Oil and for Linseed Cake, which is obtained by expression of the fixed Oil, and is employed for feeding purposes, since it contains up to 25 p.c. of proteids. Russian Linseed is often extensively adulterated with weed seeds, and even when sifted retains sufficient dirt attached to the surface to prevent the hand readily passing through a parcel of it, whereas English and Dutch permits it readily, and this test is used as a rough means of distinguishing these Linseeds. As the mucilage is contained in the epidermal cells, the seed is used in the whole state for making the decoction known as Linseed Tea. The principal features of powdered Linseed are the thin-walled, short prismatic cells, containing mucilage; yellowish spindle-shaped sclerenchymatous cells, crossed at right angles with a layer of thin-walled, elongated, compressed, colourless cells; flattened polygonal cells with porous walls, containing a brown pigment; and endosperm cells, containing characteristic aleurone grains and drops of oil. It is best examined in strong Alcohol, and Water gradually added to show the mucilage cells.

Preparations.

LINUM CONTUSUM. Crushed Linseed.

Linseed reduced to a coarse powder.

Foreign Pharmacopœias.—Official in Belg., Fr. and Ital., should contain 30 p.c. of Oil; Port., not less than 25 p.c. of Oil. Not in the others.

Tests.—Crushed Linseed is officially required to yield, when extracted with Carbon Bisulphide, not less than 30 p.c. of Oil. This is also the standard adopted by the *U.S.P.*, which also adds 'all of which is saponifiable.' The extracted Oil might with advantage be required to answer the tests for Oleum Lini. Good commercial samples, examined in the author's laboratory, yielded from 30 to 42 p.c. of oil. The *B.P.* statement that it should not yield the tests characteristic of Starch is very indefinite. Linseed contains a large proportion of Oil possessing a high Iodine absorption; if the Iodine test is applied, it is preferably carried out on the portion remaining after the extraction of the Oil with Carbon Bisulphide. The *U.S.P.* performs the test on the crushed Linseed, but gives very explicit instructions for carrying it out. A weighed quantity of 0·1 gramme is directed to be mixed with 20 c.c. of Water, the mixture heated to boiling, cooled, and diluted with cold Water to 100 c.c. The addition of 0·5 c.c. of Iodine T.S. (2·0 p.c. w/v) should not produce more than a pale blue colour. The ash of crushed Linseed varies from 3 to 4 p.c., and should not exceed 5 p.c. It is officially required to leave, when incinerated with free access of air, not more than 5·0 p.c. of ash. No ash limit appears in the *U.S.P.* The *P.G.* includes the seeds but not the crushed seeds, but no tests are given. The 1890 *U.S.P.* required a yield of not less than 25 p.c. of Oil extractable by Carbon Bisulphide, which has been raised to 30 p.c. in the 8th Decennial Revision.

OLEUM LINI. Linseed Oil.

A colourless, but more usually pale yellow, oily liquid, possessing a characteristic odour and unpleasant taste. It is a drying Oil, and tends to thicken and darken in colour on exposure to light and air. It is the Oil expressed from Linseed at ordinary temperatures.

For medicinal purposes it should be procured as fresh as possible.

Solubility.—Of a freshly expressed sample, 1 in 40 of Absolute Alcohol; 1 in 1¼ of Ether.

Medicinal Properties.—Laxative; it also acts mechanically as an **enema** for removing impacted fæces. A good application to burns in the form of **Carron Oil,** *see p.* 289.

Foreign Pharmacopœias.—Official in Austr., sp. gr. 0·932 to 0·937; Belg., Ger., Hung., Norw., Russ. and Swed., sp. gr. 0·936 to 0·940; Dan., sp. gr. 0·930 to 0·940; Dutch, sp. gr. 0·930 to 0·935; Ital., sp. gr. 0·935 to 0·940; Jap., sp. gr. 0·930 to 0·940; Port. (Oleo de Linhaca), sp. gr. 0·930;

Span. (Aceite de Linaza); Swiss, sp. gr. 0·930 to 0·937 at 15° C. and 0·880 to 0·881 at 98° C.; U.S., sp. gr. 0·925 to 0·935 at 25° C. (77° F.). Hung., also Oleum Lini Lotum.

Tests.—Linseed Oil has a sp. gr. of 0·930 to 0·936; the *B.P.* states 0·930 to 0·940, the *U.S.P.* 0·925 to 0·935 at 25° C. (77° F.); *P.G.* 0·936 to 0·940. All three Pharmacopœias are agreed that it does not congeal at temperatures above −20° C. (−4° F.). It is a drying Oil, and gradually thickens by exposure to the air, forming a hard transparent varnish; this feature is recorded in the *B.P.* and *U.S.P.*, but not in the *P.G.* Neither the Saponification value nor the Iodine absorption is given in the *B.P.*, both should be included. The Saponification value usually ranges from 190 to 195, and should not be less than 187, and the Iodine absorption from 170 to 188. The *U.S.P.* gives the Saponification value as 187 to 195 and the Iodine value as not less than 170. The *P.G.* does not include a Saponification value, but requires that the Oil shall absorb not less than 150 p.c. of Iodine.

The more generally occurring adulterations are Mineral Oils, Rosin, and Rosin Oils. Mineral and Rosin Oils are unsaponifiable, and their presence may be detected by the Potassium Hydroxide test described below. If after saponification the Alcohol be evaporated off and the residual soap be dissolved in hot Water, cooled and shaken with Ether, the ethereal solution may be separated, evaporated to dryness and the unsaponifiable residue weighed. Rosin Oil may be detected by dissolving a portion of this residue in Carbon Bisulphide and adding a few drops of a Carbon Bisulphide Solution of Stannous Bromide containing an excess of Bromine. The appearance of a violet or purple coloration is indicative of the presence of Rosin Oil. The reagent may be prepared by allowing Bromine to fall drop by drop on some granulated Tin until the permanent coloration of the product shows that the Bromine is in excess. A further moderate quantity of Bromine is then added, and the mixture, when cold, diluted with three or four times its measure of Carbon Bisulphide.

The *U.S.P.* includes a test with Glacial Acetic Acid (*see* below) for the detection of Rosin Oils. The Oil should not be more than faintly acid in reaction towards blue Litmus paper moistened with Alcohol (94·9 p.c.). The Acid value should be less than 5, though old oil may give figures as high as 7. Linseed Oil contains a small percentage of unsaponifiable matter, which should not amount to more than 2·5 p.c., and usually is considerably less. Linseed Oil, when issuing from the seed whilst pressing, has scarcely any of the odour or taste of the Linseed Oil of the shops, but acquires it in a very short time on exposure to the air. For medicinal purposes it should be procured as fresh as possible. Boiled Linseed Oil is used in the arts as a drying Oil, and for certain purposes Litharge and Manganese are added during the boiling. The boiled Oil may therefore contain both Lead and Manganese. It may be detected by the increased sp. gr. and the great decrease in the Iodine absorption.

The rise of temperature on treating the Oil with Sulphuric

Acid (Maumené's test) is a useful constant for the Oil, it should not be less than 114° C. (237·2° F.).

Potassium Hydroxide.—If 27 parts of Potassium Hydroxide T.S. and 2 parts of Alcohol (90 p.c.) be added to 20 parts of Linseed Oil, warmed in a deep tin or porcelain vessel, and the mixture stirred and again warmed until saponification is complete, the soap formed should be soluble in Water or Alcohol (90 p.c.) without residue, *P.G.*; it should be completely saponifiable with Alcoholic Potassium Hydroxide T.S., and the resulting soap should be completely soluble in Water without leaving an oily residue, *U.S.P.*

Glacial Acetic Acid.—2 c.c. of the Oil warmed and shaken in a test-tube with an equal volume of Glacial Acetic Acid should yield, on cooling and the addition of 1 drop of Sulphuric Acid, a greenish colour. A violet colour indicates the presence of Rosin or Rosin Oils, *U.S.P.*

Not Official.

CATAPLASMA LINI.—Linseed Meal, 4; Boiling Water, 10. Mix the Linseed Meal with the Water gradually, with constant stirring. In cold weather the basin should be previously rinsed with boiling Water.

Applied to inflamed parts.

Foreign Pharmacopœias.—Official in Fr., Mex., Port. and Span.

Not Official.

LITHIUM.

Li, eq. 6·97.

A silver-white, brilliant, ductile metal, having the density of 0·59.

It is obtained from several minerals—Petalite, Lepidolite, Triphane, and formerly from Triphylline.

Official Preparations.—Lithii Carbonas, Lithii Citras.

Not Official.—Lithii Benzoas, Lithii Bromidum, Lithii Guaiacas, Lithii Hippuras, Lithii Quinas, Lithii Salicylas, Lithii Theobrominæ Salicylas, Lithii Bitartras.

Tests.—Lithium has a sp. gr. of 0·59. The characteristic test for Lithium is the crimson colour which its salts, especially when moistened with Hydrochloric Acid, communicate to a non-luminous flame. An aqueous solution of a Lithium salt affords a precipitate with Sodium Phosphate Solution.

LITHII CARBONAS.

LITHIUM CARBONATE.

Li_2CO_3, eq. 73·49.

Fr., Carbonate de Lithine; Ger., Lithiumcarbonat; Ital., Carbonato di Litio; Span., Carbonato de Litina o Litico.

A light white, amorphous, odourless powder, alkaline in reaction. It may be obtained from native Lithium Silicates.

The salts official in the *B.P.* and the *U.S.P.* are required to contain not less than 98·5 p.c. of pure Lithium Carbonate, the *P.G.* does not specify the percentage.

It should be kept in well-stoppered glass bottles.

Solubility.—About 1 in 70 at 60° F.; in hot Water it is only soluble to about half this extent, a solution saturated in the cold becoming quite turbid on boiling. It should be noticed that using 1 part of Lithium Carbonate to 70 parts of Water solution is very slow, and using these proportions in oz. it requires several weeks' digestion, with frequent shaking, before complete solution is effected.

Medicinal Properties.—Diuretic. Combined with Carbonic Acid, in a diluted solution, as in Lithia Water, it has been given in cases of gout with the view of increasing the alkalinity of the blood, and acting as a solvent of the Sodium Biurate deposits.

Luff has shown that the Lithium salts do not exercise any special solvent effect on Sodium Biurate, and that their administration to gouty subjects with the object of removing uratic deposits in the joints and tissues appears to be useless.—*L.* '98, i. 1609.

He also found that Lithium salts, although they did not delay the initial conversion of the gelatinous Sodium Biurate into the crystalline forms, yet when the conversion was once started it was slowed by the presence of these salts and especially by the Lithium Carbonate. In the treatment of gout the Potassium salts were the most useful, and the Lithium salts ranked next.—*L.* '00, i. 931; *B.M.J.* '00, i. 836.

Cases of cardiac depression and even dilatation, as the result of the excessive and continued consumption of Lithia tablets, which are so persistently vaunted as curative of gout.—*Pr.* '07, i. 166.

1 grain of Lithium Carbonate with $\frac{1}{35}$ grain Sodium Arsenate given in aërated Water has been recommended by Martineau in the treatment of diabetes.—*L.* '87, i. 650.

Dose.—2 to 5 grains = 0·13 to 0·32 gramme.

Prescribing Notes.—*Given in aërated Water,* **cachets,** *or Compressed Tablets.* **Varalettes** *are effervescing tablets.*

For the **granular effervescent** *form, see* Lithii Citras.

Official Preparation.—Used in the preparation of Lithii Citras.

Not Official.—Liquor Lithii Carbonatis.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S. Span., also Carbanato de Litina efervescente.

Tests.—Lithium Carbonate dissolves slowly in Water and yields a solution which has an alkaline reaction towards red Litmus paper. It dissolves in diluted Hydrochloric Acid with effervescence, yielding a solution which gives the tests distinctive of Lithium given under that heading, and a colourless gas which, passed into Lime Water, affords a white precipitate, which again dissolves if a sufficient excess of the gas be passed through the liquid, or which is soluble with effervescence in Hydrochloric Acid. It is officially required to yield 98·5 p.c. of Lithium Carbonate as gravimetrically determined by neutralising 1 gramme of the salt with Sulphuric Acid, and subsequently heating to redness. The weight of dried Lithium Sulphate should amount to 1·479 grammes. It should be noted that the weight of Lithium Carbonate corresponding to 1·479 grammes of Lithium Sulphate is 0·9946 gramme, calculating out to 99·46 p.c. and not, as officially stated, 98·5 p.c. The *U.S.P.* and the *P.G.* employ volumetric methods of determination. The *U.S.P.* requires the salt to yield 98·5 p.c. of pure Lithium Carbonate as volumetrically determined by the process given in the small type below. The *P.G.* process, also given below, is direct titration. It is performed on the salt dried at 100° C. (212° F.) and indicates 99·24 p.c. of Lithium Carbonate.

The more generally occurring impurities are Aluminium, Ammonium, Arsenic, Copper, Iron, Lead, Magnesium, Potassium, Sodium, Zinc, and Chlorides, for which it is officially required to yield no characteristic reaction, and Calcium and Sulphates, for which it is required to yield only the slightest reactions. The salt when dissolved in diluted Acetic Acid should leave no insoluble residue. In examining for impurities the salt may be dissolved in diluted Hydrochloric Acid. The presence of Iron and Aluminium may be detected by the addition of Ammonia Solution as described in the Ammonia test below. Arsenic, Copper, and Lead may be detected by the Hydrogen Sulphide test, Zinc by the subsequent addition of Ammonia. A standard for Lead of 10 parts per million is suggested (*C.D.* '08, i. 796), and 2 parts per million for Arsenic. Magnesium may be detected by the usual group reagents; Ammonium, by the behaviour on boiling with Liquor Potassæ, Potassium and Sodium in the residue after separation of all other metals and evaporation to dryness. Calcium, Chlorides and Sulphates, may be detected by the tests given below in small type, with Ammonium Oxalate, Silver Nitrate, and Barium Nitrate Solutions, respectively. The *P.G.* requires that 0·2 gramme of Lithium Carbonate dissolved in 1 c.c. of Hydrochloric Acid and evaporated to dryness, should leave a residue which yields a clear solution in 3 c.c. of Alcohol. The *U.S.P.* uses the Amyl Alcohol test, as described below, in fixing a limit of other alkalis.

Acetic Acid.—1 gramme of the salt dissolved in 40 c.c. of diluted Acetic Acid should leave no insoluble residue, *U.S.P.*

Ammonia.—1 part of Lithium Carbonate mixed with 20 parts of Water and Hydrochloric Acid added drop by drop until the salt is dissolved yields a solution which, on the addition of T.S. of Ammonia until it is of akaline reaction, should produce neither turbidity nor precipitation either before or after boiling, *U.S.P.*

Hydrogen Sulphide.—An aqueous solution of the salt (1 : 50) obtained by the aid of Nitric Acid after the addition of excess of T.S. of Ammonia, should be unaffected by T.S. of Hydrogen Sulphide, *P.G.*; a solution obtained as directed in the preceding *U.S.P.* test should not respond to the time-limit test for heavy metals, *U.S.P.*

Silver Nitrate.—A solution (1 : 50) of the salt as above should not become turbid more than opalescent with T.S. of Silver Nitrate, *P.G.*

Barium Nitrate.—A solution (1 : 50) of the salt as above is unaffected by T.S. of Barium Nitrate, *P.G.*

Ammonium Oxalate.—A solution (1 : 50) of the salt as above is unaffected by T.S. of Ammonium Oxalate.—*P.G.*

Amyl Alcohol.—If to 0·2 gramme of the salt contained in a flat-bottomed flask of 50 c.c. capacity a slight excess of Hydrochloric Acid be added and the mixture evaporated almost to dryness on a water-bath, and if 10 c.c. of Amyl Alcohol [boiling point 132° C. (269·6° F.)] be added and the mixture cautiously heated until the lower aqueous layer has evaporated, then upon the addition of 3 drops of Hydrochloric Acid and boiling for three minutes the resulting insoluble residue should weigh not more than 0·003 gramme. The removal of the Water from the Amyl Alcohol mixture is facilitated by passing a current of air through the hot solution, *U.S.P.*

Volumetric Determination.—0·5 gramme of Lithium Carbonate dried at 100° C. (212° F.) should require for neutralisation not less than 13·4 c.c. of

Normal Volumetric Solution of Hydrochloric Acid, *P.G.*; a solution of 0·5 gramme of Lithium Carbonate in 20 c.c. of Normal Sulphuric Acid Volumetric Solution should require not more than 6·6 c.c. of Normal Potassium Hydroxide Volumetric Solution for complete neutralisation, using Methyl Orange Solution as indicator, *U.S.P.*

Not Official.

LIQUOR LITHII CARBONATIS (Lithia Water).—10 fl. oz. of aërated Water contain 5 grains of Lithium Carbonate.

LITHII CITRAS.

LITHIUM CITRATE.

$Li_3C_6H_5O_7$, $4H_2O$, eq. 280·05.

A white crystalline powder, possessing a cool, slightly alkaline taste.

It may be prepared by neutralising Citric Acid with Lithium Carbonate.

It has been recommended that the formula should be altered to $Li_3C_6H_5O_7$, $5H_2O$, eq. 297·93. The 8th Decennial Revision of the *U.S.P.* maintains the same formula as the *B.P.* 1898. Dott states (*C.D.* '05, i. 489) that the formula with four molecules of Water of crystallisation is generally accepted as accurate. It has been pointed out (*C.D.* '05, i. 489) that the *B.P.* is inaccurate in describing the salt as deliquescent. *U.S.P.* describes it as deliquescent in moist air.

Solubility.—1 in 2 of Water; almost insoluble in Alcohol (90 p.c.).

The solubility in Water is variously given as 1 in 5 to 1 in 25.

Medicinal Properties.—Similar to those of the Carbonate, but the Citrate being more soluble, it is better adapted for fluid administration.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Prescribing Notes.—*Generally given in* solution, *or in the form of Lithii Citras Effervescens.*

Official Preparation.—Lithii Citras Effervescens.

Not Official.—Lithii Citras Laxativus Effervescens.

Foreign Pharmacopœias.—Official in U.S.; Mex. (Citrato de Litio). Not in the others.

Tests.—Lithium Citrate responds to the tests distinctive of Lithium given under that heading. A 5 p.c. aqueous solution of the salt yields, when boiled with an excess of Calcium Chloride Solution, a white precipitate insoluble in Potassium or Sodium Hydroxide Solution, soluble in Ammonium Chloride Solution. Its aqueous solution is generally faintly alkaline in reaction towards red Litmus paper, but should not redden Phenolphthalein Solution.

It is officially required to lose 19·0 p.c. of moisture when dried at 100° C. (212° F.) and an additional 6·5 p.c. at a temperature of 115·5° C. (240° F.). This statement has been shown (*C.D.* '05, i. 489) to be incorrect. Well-defined crystals, apparently quite dry, lose considerably more than 19·0 p.c. at 100° C. (212° F.). Some large crystals, after exposure for two days to the air, lost 24·8 p.c. under 100° C. (212° F.), and when heated to a temperature of 150° to 160° C. (302° to 320° F.) lost a further 2·8 p.c.

The *B.P.* requires 2 grammes of the salt to leave when burned at a low red heat with a free access of air 0·77 gramme of white residue, corresponding to 98·5 p.c. of the pure Citrate. It is an extremely difficult matter to obtain a white residue, when burned at a low red heat, and, assuming the residue to consist of Lithium Carbonate, the Pharmacopœia figure corresponds to 97·80 p.c. of pure Lithium Citrate, and not 98·5 as officially stated. The *U.S.P.* gravimetric method of determination requires that the salt shall contain not less than 98·44 p.c. nor more than 100·2 p.c. of pure Lithium Citrate. The Carbonate left on cautious ignition is converted into Sulphate, and the complete oxidation of the carbonaceous residue ensured by cautiously re-igniting the residue with a few drops each of Nitric and Sulphuric Acid. The Citrate is not official in the *P.G.*

The Citrate being prepared from Lithium Carbonate, the impurities present in the latter are also liable to be present in the former, and the same methods as are adopted for their detection may also be employed, *see* Lithii Carbonas. Standards are suggested (*C.D.* '08, i. 796) of 5 parts per million for Lead, and of 1 part per million for Arsenic. The tests for Iron and Aluminium may be carried out on the residue left on ignition after neutralisation with Hydrochloric Acid.

Gravimetric Determination.—0·5 gramme of Lithium Citrate, dried at 150° C. (302° F.), cautiously ignited in a porcelain crucible, the residue cooled, then moistened with a few drops of Nitric and Sulphuric Acids and again cautiously ignited, repeating this operation until the residue of Lithium Sulphate becomes white and of constant weight, it should weigh not less than 0·387 gramme nor more that 0·394 gramme, *U.S.P.*

Ammonia.—Dissolve the residue of Lithium Sulphate remaining from the gravimetric determination in 10 c.c. of boiling Water and acidify with Hydrochloric Acid. The addition of Ammonia Water until the solution has an alkaline reaction should not cause a turbidity or produce a precipitate either before or after boiling, *U.S.P.*

Time-limit Test.—The (1–20) solution acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Amyl Alcohol.—Let the residue obtained by igniting 0·2 gramme of the salt at a red heat be treated with a slight excess of diluted Hydrochloric Acid and the mixture filtered. Then if the filtrate and washings be evaporated and further treated as described under the same heading under Lithium Carbonate, the resulting insoluble residue should weigh not more than 0·002 gramme, *U.S.P.*

Preparation.

LITHII CITRAS EFFERVESCENS. Effervescent Lithium Citrate.

Sodium Bicarbonate, in powder, 58; Tartaric Acid, in powder, 31; Citric Acid, in powder, 21; Lithium Citrate, 5: make into granules.
(1 in 20)

Dose.—60 to 120 grains = 4 to 8 grammes.

Foreign Pharmacopœias.—Official in U.S. Not in the others.

Not Official.

LITHII CITRAS LAXATIVUS EFFERVESCENS.—Lithium Citrate, 10; Sodium Phosphate, dried, 30; Sodium Bicarbonate, 44; Tartaric Acid, 15; Citric Acid, 17·50.—*Bournemouth Formulary*, and *B.P.C.*

LITHII BENZOAS ($Li\ C_7H_5O_2$, eq. 127·10).—A white powder, or small shining scales, with a faintly acid reaction; the taste is sweet and somewhat saline. It can be prepared by boiling, in Water, 73·49 parts of Lithium Carbonate with 242·26 parts of Benzoic Acid, and evaporating.

It should contain not less than 98·5 p.c. of pure Lithium Benzoate.

It should be kept in well-stoppered bottles and in a cool atmosphere.

Solubility.—1 in 2½ of Water; 1 in 15 of Alcohol (90 p.c.).

The solubility of the salt varies with the amount of uncombined Benzoic Acid which it contains. A pure salt prepared by exactly neutralising Lithium Carbonate with its ascertained equivalent of Benzoic Acid gave the above figure. The figure 1 in 14 recorded in the *Pocket Companion* was obtained from a sample containing 8·6 p.c. of free Benzoic Acid. *See* also under Tests.

Medicinal Properties.—Used extensively in gouty conditions.

Dose.—15 to 30 grains = 1 to 2 grammes.

Foreign Pharmacopœias.—Official in Fr., Ital., Span. (Benzoato Litico), and U.S.; Mex. (Benzoato de Litio). Span. has also Benzoato Litico efervescente. Not in the others.

Tests.—Lithium Benzoate fuses when heated, and at a higher temperature chars, evolving vapours having a Benzoin odour, and finally burns away leaving a residue of Lithium Carbonate. It responds to the tests distinctive of Lithium given under that substance. Its aqueous solution is alkaline in reaction towards red Litmus paper, and, if well prepared, is neutral in reaction towards Phenolphthalein Solution, but commercial samples are frequently acid in reaction towards Phenolphthalein Solution, requiring an appreciable quantity of Tenth-normal Volumetric Potassium or Sodium Hydroxide Solution to restore neutrality.

Samples examined in the author's laboratory have contained from 6 to 14 p.c. of uncombined Benzoic Acid. A 5 p.c. aqueous solution yields with Ferric Chloride T.S. a buff coloured precipitate. A concentrated aqueous solution affords with Hydrochloric Acid a white precipitate soluble in Ether and in Potassium and Sodium Hydroxide Solution. If this precipitate be separated, washed till free from mineral acid, and carefully dried it should possess the m.p., respond to the tests for and be free from the impurities mentioned under 'Acidum Benzoicum.'

The salt is official in the *U.S.P.* and is required to contain not less than 97·66 p.c. nor more than 100·2 p.c. of pure Lithium Benzoate as gravimetrically determined by cautiously igniting in a porcelain crucible a weighed quantity of the salt with about twice its weight of powdered anhydrous Ammonium Sulphate, the weight being recorded when constant. The *U.S.P.* 'purity rubric' says it shall contain not less than 98·5 p.c. of pure Lithium Benzoate, which does not correspond with the above gravimetric determination. The percentage of Lithium Benzoate may also be determined from the alkalinity of the residue on ignition, and this method was adopted in *U.S.P.* 1890. The process was not accurate, and was tedious, on account of the difficulty of burning off the carbonaceous matter. The author has found the following method of direct titration both expeditious and accurate:—Dissolve a weighed quantity of 1 gramme of the salt in 50 c.c. of pure Distilled Water, add about 10 c.c. of Ether and a few drops of Phenolphthalein Solution, shake and titrate with Tenth-normal Volumetric Sodium Hydroxide Solution; 1 c.c. of the Tenth-normal Alkali Solution = 0·012113 gramme Benzoic Acid. A few drops of Methyl Orange Solution are added and the titration continued with Tenth-normal Volumetric Sulphuric Acid Solution, 1 c.c. of which = 0·01271 gramme Lithium Benzoate.

LITHII BROMIDUM ($Li\ Br$, eq. 86·32).—A white, granular, deliquescent salt, having a sharp and somewhat bitter, saline taste.

It should contain not less than 97 p.c. of pure Lithium Bromide.

It should be kept in well-stoppered glass bottles of a dark amber tint and in a cool place.

Solubility.—1 in 1 of Water; 1 in 4 of Alcohol (90 p.c.).

Medicinal Properties.—Owing to the low atomic weight of Lithium, this salt contains more Bromide than either Potassium or Sodium Bromide, and consequently has been recommended as a hypnotic for gouty patients, and in epilepsy.

In the insomnia of neurasthenia (30 grains three times a day).—*Pr.* li. 351. In Bright's disease.—*L.* '95, ii. 685. In gouty cases of aural vertigo, especially when preceded by a mercurial purge.—*M.A.* '95, 221.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Foreign Pharmacopœias.—Official in Russ. and U.S.; Mex., Bromuro de Litio. Not in the others.

Tests.—Lithium Bromide fuses when heated at a low red heat, and is slowly volatilised at a higher temperature. It responds to the tests distinctive of Lithium given under that heading. Its aqueous solution is slightly alkaline in reaction towards red Litmus paper, and when acidulated with Nitric Acid affords with Silver Nitrate Solution a yellowish curdy precipitate, insoluble in Nitric Acid, practically insoluble in Ammonia Solution, but soluble in Potassium Cyanide Solution. Chlorine Water added cautiously to the aqueous solution affords a yellowish coloration, and if the liquid be shaken with Chloroform the colour passes into the Chloroform solution. The salt is official in the *U.S.P.* and is required to contain not less than 97·13 p.c. nor more than 103·17 p.c. of pure Lithium Bromide as volumetrically determined by dissolving a weighed quantity of the dried salt in a measured quantity of Water and titrating an aliquot portion of the solution with Tenth-normal Volumetric Silver Nitrate Solution, using Potassium Chromate Solution as an indicator.

The more generally occurring impurities are those also mentioned under Lithium Carbonate, and similar tests may be employed for their detection. The *U.S.P.* includes a test for Potassium with Sodium Cobaltic Nitrite Solution, prepared by dissolving 4 grammes of Cobaltous Nitrate and 10 grammes of Sodium Nitrite in about 50 c.c. of Water, adding 2 c.c. of Acetic Acid and diluting with sufficient Water to produce 100 c.c.; 0·5 c.c. of this solution added to 5 c.c. of a 5 p.c. aqueous Lithium Bromide Solution should not in 10 minutes produce either a turbidity or precipitate. Iodine may be detected by a violet coloration imparted to the chloroformic or Carbon Bisulphide Solution of the Bromine liberated when the aqueous solution of the salt is treated with Chlorine Water and shaken with either of these solvents.

LITHII GUAIACAS.—Is prepared by digesting pure Guaiacum Resin in an aqueous solution of Lithium Oxide, decanting the clear solution, evaporating and scaling it. Composed of Lithium Oxide, 1; Guaiacum Resin, 3.

Given for chronic gout and some forms of rheumatism.

Tests.—Lithium Guaiacate responds to the tests distinctive of Lithium given under that heading. The aqueous solution yields a blue coloration on the addition of a drop of Ferric Chloride T.S

Dose.—5 grains = 0·32 gramme, twice a day; made into a pill with Dispensing Syrup.

LITHII HIPPURAS.—A white micro-crystalline powder, soluble 1 in 2½ of Water. It has been used as a solvent for Uric Acid deposits.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Tests.—Lithium Hippurate yields the tests distinctive of Lithium given under that heading. Its neutral aqueous solution yields on the addition of Hydrochloric Acid an immediate crystalline deposit, and with Ferric Chloride T.S. a cream coloured precipitate, soluble in excess of the reagent.

LITHII QUINAS (Lithium Kinate. Urosine).—A whitish or brownish-white, granular, effervescent powder, or in the form of tablets. A 50 p.c. solution is also supplied for dispensing. Employed as a solvent of Uric Acid deposits in gout.—*B.M.J.* '99, i. 1470; '01, ii. 478; *L.* '99, i. 1722; *P.J.* '00. i. 57.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Tests.—Lithium Chinate affords the tests distinctive of Lithium given under that heading.

LITHII SALICYLAS $LiC_7H_5O_3$, eq. 142·98.—A deliquescent, white or greyish-white powder, with a faintly acid reaction and a sweetish taste.

It should contain not less than 98·5 p.c. of pure Lithium Salicylate.

It should be kept in well-closed glass bottles of a dark amber tint.

Solubility.—4 in 3 of Water; 1 in 2 of Alcohol (90 p.c.).

Medicinal Properties.—A remedy for gout and rheumatism.

Is much better than Sodium Salicylate in chronic articular rheumatism.—*B.M.J.* '86, i. 38; '87, i, 695.

Dose.—10 to 30 grains = 0·65 to 2 grammes.

Foreign Pharmacopœias.—Official in Belg., Fr., Ger., Mex. (Salicilato de Litio), Span. and U.S. Span. has also Salicilato de litina efervescente. Not in the others.

Tests.—Lithium Salicylate when strongly heated is decomposed, leaving a residue of Lithium Carbonate and unburnt Carbon, and evolving an odour of Phenol. It yields the tests distinctive of Lithium given under that heading. The aqueous solution is faintly acid in reaction towards blue Litmus paper, and yields with Ferric Chloride T.S. a violet coloration if not too concentrated, and in very strong solutions a deep red colour changing to a deep violet on dilution. A concentrated aqueous solution yields on the addition of Hydrochloric Acid a white crystalline precipitate which, when separated, washed free from mineral acid, and carefully dried, responds to the tests and should be free from the impurities given under 'Acidum Salicylicum.' When warmed with concentrated Sulphuric Acid and a few drops of Methyl Alcohol, the salt evolves an odour of Wintergreen Oil. The salt is official in the *U.S.P.* and *P.G.* The former Pharmacopœia requires it to contain not less than 98·36 p.c. nor more than 100·46 p.c. of pure Lithium Salicylate as gravimetrically determined by cautiously igniting a weighed quantity of the salt in a porcelain crucible with about twice its weight of powdered anhydrous Ammonium Sulphate and recording the weight of the residue when constant. No method of determination is given in the *P.G.*

It is liable to contain the impurities mentioned under Lithium Carbonate, and the same methods as there described may be employed for their detection. The Salicylic Acid should be separated before applying the tests, the tests being carried out on the filtrate from the Salicylic Acid. In addition, the aqueous solution of the salt should be colourless or almost colourless, it should not effervesce on the addition of diluted acids, and when shaken with 15 parts of concentrated Sulphuric Acid, it should not impart any colour to the acid in 15 minutes, indicating respectively the absence of Iron salts, Carbonates and foreign organic matters.

LITHII THEOBROMINÆ SALICYLAS (Lithium Diuretin, Uropherin, Uropherin Salicylate).—A white, odourless powder, readily soluble in Water. Used as a diuretic.

Dose.—15 to 20 grains = 1 to 1·3 grammes.

Tests.—Lithium Theobromine Salicylate affords the tests distinctive of Lithium given under that heading. The aqueous solution affords with Ferric Chloride T.S. a violet coloration.

LITHII BITARTRAS (Lithium Acid Tartrate).—A white, odourless, crystalline powder, readily soluble in Water. It has been used in gouty affections.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Uricedin.—A yellowish-brown, granular powder, containing principally Sodium Citrate, Lithium Citrate and Sodium Sulphate. Stated to afford relief in gout more from the pleasant laxative action than from pain-diminishing effects; results in acute gout not thoroughly satisfactory.—*L.* '05, i. 83.

Dose.—60 to 120 grains = 4 to 8 grammes.

LOBELIA.

LOBELIA.

FR., LOBÉLIE ENFLÉE; GER., LOBELIENKRAUT; ITAL., LOBELIA.

The dried flowering Herb of *Lobelia inflata*, Linn.

Imported from North America.

It contains a non-volatile, poisonous alkaloid, **Lobeline,** a volatile Oil, a fixed Oil, a neutral principle, 'Inflatine,' and a characteristic acid, Lobelic Acid; the alkaloid is a powerful emetic.

Medicinal Properties.—In small doses it is depressant, antispasmodic, diaphoretic, diuretic and expectorant. More freely used, it is cathartic and emetic; but as an emetic it is too distressing as well as too hazardous for general use, as it has a powerful effect on the respiration, and may cause death. It is chiefly used in spasmodic asthma, also in laryngeal and bronchial catarrh with thick and scanty secretion, severe croup, and for the paroxysmal dyspnœa of chronic bronchitis and of whooping-cough. In some cases a useful adjunct to diuretics. Its action in asthma is promoted by the addition of Bromide or Iodide.

Ph. Ger. maximum single dose, 0·1 gramme; maximum daily dose, 0·3 gramme.

Official Preparation.—Tinctura Lobeliæ Ætherea.

Not Official.—Pulvis Lobeliæ Compositus, Tinctura Lobeliæ.

Antidotes.—In case of poisoning by Lobelia, the most active stimulants should be employed, as well as the stomach-tube. Recumbent position imperative.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Swed., Swiss and U.S. Not in Span.

Descriptive Notes.—The usual form in which the drug is imported consists of rectangular cakes of the chopped herb (1 to $1\frac{3}{4}$ in. thick), compressed and wrapped in paper, or more rarely in the form of the entire herb dried. The official description directs the flowering herb (collected after a portion of the capsules have become inflated, *U.S.P.*). The harvest is collected in August and September, about which time the new crop is obtainable. The stems are often purplish, have alternate leaves, are obovate or oblong, irregularly toothed (serrate-denticulate, *U.S.P.*), and have 1-celled hairs. The capsules are inflated and 2-celled, and contain, when ripe, minute oblong reticulated brown seeds $\frac{1}{50}$ in. long (0·5 to 0·7 mm. long, *P.G.*) by $\frac{1}{240}$ in. in diameter. The transverse section of the stem contains laticiferous vessels in the bast. It has a somewhat irritating odour, and a burning acrid taste is slowly developed when the seeds are chewed. The hairs are more frequent on the under surface of the leaves and on the middle and lower portion of the stem. The edge of the leaf bears small whitish glands. According to Lloyd, preparations of the seed are more uniform and reliable than those of the herb. The distinctive microscopical features of *Lobelia inflata* are the whitish glands on the margin of the leaf, the 1-celled hairs with cuneate cells around their base, the large epidermal cells and the laticiferous cells and the reticulated seed coats. As the seeds are more expensive than the drug, mature capsules are rarely found in the dried herb.

Tests.—Lobelia yields from 5 to 10 p.c. of ash.

Preparation.

TINCTURA LOBELIÆ ÆTHEREA. ETHEREAL TINCTURE OF LOBELIA.

4 of Lobelia, percolated with Spirit of Ether to yield 20.

Now 1 in 5 instead of 1 in 8.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Foreign Pharmacopœias.—Official in Mex., 1 and 5. Not in the others.

Tests.—Ethereal Tincture of Lobelia has a sp. gr. of 0·815 to 0·820; contains from 1 to 2 p.c. w/v of total solids and about 65 p.c. w/v of Absolute Alcohol. A determination of the Alcohol may be made by converting it into a crystalline Calcium Chloride product and removing the Ether by a current of air.

Not Official.

PULVIS LOBELIÆ COMPOSITUS.—Potassium Nitrate, 240; Boiling Distilled Water, 240; dissolve, and add to Lobelia, in powder, 240; Stramonium Leaves, in powder, 240; Black Tea, in powder, 240. Mix well, dry, and add Oil of Anise, 1.—*Martindale.*

This formula has been incorporated in the *B.P.C.* as follows:

Lobelia, 25; Stramonium, 25; Potassium Nitrate, 25; Oil of Anise, 0·10; Distilled Water, boiling, 25; Tea Leaves, in powder, *q.s.* to produce 100. Same directions as above.

TINCTURA LOBELIÆ.—1 of Lobelia, percolated with Alcohol (60 p.c.), to yield 8. (1 in 8)

Dose.—10 to 30 minims = 0·6 to 1·8 c.c.; but 1 fl. drm. = 3·6 c.c. may be given for asthmatic dyspnœa; repeated every 15 minutes until nausea is produced.

Ph. Ger. maximum single dose, 1 gramme; maximum daily dose, 3 grammes of the 1 in 10 Tincture.

B.P. '85, but omitted in '98; included in *B.P.C. Formulary* 1901, and incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Norw., Span., Swed., Swiss and U.S., 1 in 10; Hung., Mex. and Port., 1 in 5; all by weight except U.S. U.S. has also Fluidextractum Lobeliæ, 1 in 1, using diluted Acetic Acid as the menstruum.

The *Brussels Conference* agreed to a strength of 10 p.c., prepared by percolation with Alcohol (70 p.c.).

Tests.—Tincture of Lobelia has a sp. gr. of about 0·930; contains about 2 p.c. w/v of total solids and about 50 p.c. w/v of Absolute Alcohol.

Farr and Wright (*C.D.* '93, i. 454) conclude that extraction of alkaloid depends very little upon the strength of Alcohol, and reckon Alcohol (50 p.c.) to be least objectionable. Details of determination process are given, and the figures show the Tincture to vary between 0·027 and 0·044 (average 0·038) p.c. of alkaloid = 0·3 p.c. for average drug.

In the Tincture or an aqueous solution of the drug the alkaloid is destroyed by heat. When evaporation is required the solution must be acidified (*P.J.* (3) xvii. 1037; (3) xviii. 135); but Farr and Wright repeatedly exposed their pure alkaloidal residue to 100° C. without loss of weight, and it continued to give the usual alkaloidal reactions.—*C.D.* '93, i. 454.

LUPULUS.

HOPS.

B.P.Syn.—HUMULUS.

FR., HOUBLON; GER., HOPFEN; ITAL., LUPPOLO; SPAN., LUPULO.

The dried Strobiles of *Humulus Lupulus*, L., collected from cultivated Plants.

Medicinal Properties.—Bitter stomachic, sedative. Has been recommended in the treatment of alcoholism. It sometimes produces sleep when opiates are objectionable. Hops may be used topically as fomentation or poultice in painful inflammatory swellings; and for colic and other internal pains. Hop (which has been carefully dried and preserved) is made into a pillow, to induce sleep.

The Hop pillow probably owed any reputation it ever had to its coolness and the suggested purpose of its use rather than to any direct influence of the odour. —*L.* '08, i. 427.

Incompatibles.—Mineral acids, metallic salts.

Official Preparations.—Infusum Lupuli and Tinctura Lupuli. *See* also Lupulinum.

Not Official.—Extractum Lupuli.

Foreign Pharmacopœias.—Official in Fr. (Houblon), Mex. (Lupulo), Port., Span. and U.S. Not in the others.

Descriptive Notes.—In this country hops are chiefly cultivated in Kent, Hertford, Sussex, Hants, Surrey and Worcester, and are imported occasionally from Bavaria, Belgium, Holland, the United States and Canada. Many varieties are in cultivation, differing chiefly in shape and size, and slightly in flavour and bitterness. Usually hops are subjected to the vapour of Sulphurous Acid to prevent the brownish coloration and the development of the Valerianic Acid odour which takes place in old hops. The strobiles in commerce vary in length from ¾ to 1½ in. (19 to 37 mm.); *B.P.* and *U.S.P.* about 30 mm. They are oval or oblong-oval in outline, and consist of imbricated membranous stipules and bracts, each bract having in its axil a small rounded fruit or achene, which, as well as the bracts and stipules, bear numerous yellow glands, in which the bitter taste and the odour principally reside. The best test of the freshness of hops is the odour, which becomes distinctly valerianic in hops that have been kept long. The amount of Lupulin present should be noted, especially if strobiles are much broken, as it is said to be the practice in some places to sift out as much Lupulin as possible for separate sale. The quality of hops has been judged by the amount of extract yielded to Benzol, which varies from 12 to 19 p.c.; Worcester hops yielded 17·1 p.c.; Sussex 16 p.c.; Kent 14·6 p.c.; and the highest percentage was obtained from Californian hops. From unsulphured hops the extract is green, from sulphured hops brown. On distillation with Water, hops yield 0·9 p.c. of volatile oil. Besides the bitter principle, Lupulite, hops contain Lupulotannic Acid and three resins.

Tests.—The ethereal extract obtained from Hops varies from 9 to 15 p.c. and consists of oil, resin and bitter principle. The ash varies from 5 to 7 p.c. and should not exceed the latter figure.

Preparations.

INFUSUM LUPULI. Infusion of Hops.

Hops, freshly broken, 1; Distilled Water, boiling, 20; infuse 15 minutes; strain. (1 in 20)

Dose.—1 to 2 fl. oz. = 28·4 to 56·8 c.c.

Foreign Pharmacopœias.—Official in Fr. and Mex., 1 in 100. Not in the others.

TINCTURA LUPULI. Tincture of Hops. *N.O.Syn.*—Tinctura Humuli.

4 of Hops, macerated with 20 of Alcohol (60 p.c.). (1 in 5)

B.P. '85 was 1 in 8.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Mex., 1 in 5. Not in the others.

Tests.—Tincture of Hops has a sp. gr. of 0·930 to 0·935; contains about 4 p.c. w/v of total solids and about 56 p.c. w/v of Absolute Alcohol.

LUPULINUM. Lupulin.

Glands obtained from the Strobiles of *Humulus Lupulus.*

Medicinal Properties. Bitter stomachic, sedative.

Dose.—2 to 5 grains = 0·13 to 0·32 gramme.

Prescribing Notes.—*Given in* **cachets** *or* **pills.** *A good pill can be made by means of Alcohol* (90 *p.c.*), *q.s.*

Not Official.—Extractum Lupulini, Fluidextractum Lupulini, Oleoresina Lupulini and Tinctura Lupulini.

Foreign Pharmacopœias.—Official in Austr., Dutch, Hung., Ital., Port., Span., Swiss and U.S.

Descriptive Notes.—The Lupulin of commerce is obtained by stripping the bracts off the strobiles, and separating the powder by a sieve, or by sifting the deposit of Lupulin that forms at the bottom of the hop kilns and hop pockets. The grains of Lupulin are officially described as consisting of a single layer of cells, the cuticle of which has been raised by the secretion of oil or oleoresin. The strobiles yield about 8 to 12 p.c. of Lupulin which, when incinerated, leaves about 7·3 p.c. of ash. It may contain, as impurities, debris of the bracts and sand or earthy matter, the amount of which can be roughly estimated by floating the Lupulin on Water, when the heavier matter will sink to the bottom. The contents of the glands (about 75 p.c.) are liquid at first, concreting into a mass in the centre, and consist of Myricyl Palmitate, resin, a bitter principle named Lupulite, or Lupamarin, and an essential oil containing Valerol, which changes gradually to Valerianic Acid. When fresh it is of a greenish or yellow colour from dried hops, but of brownish-yellow colour from sulphurated hops, and becomes darker on keeping and acquires a distinct odour of Valerianic Acid. When triturated in a mortar the glands are ruptured and can be worked into a plastic mass.

Tests.—Lupulin is officially required to contain not more than 40 p.c. of matter insoluble in Ether; the *U.S.P.* requires that it shall contain not less than 60 p.c. of matter soluble in Ether. The official limit of ash is not more than 12 p.c., that of the *U.S.P.* not more than 10 p.c. It has been suggested (*Y.B.P.* '03, 245) that the ash standard should be raised to 'not exceeding 14 p.c.' Eight samples examined in the author's laboratory gave 28·2, 33·8, 29·9, 27·9, 20·6, 12·1, 18·7, and 25·4 p.c. of ash. The Report of the Committee of Reference in Pharmacy states, 'presumably this drug will be omitted in the next *B.P.*, as it is practically never used.' The proposed raising of the ash figure would admit more rubbish than at present. The figure of 10 p.c. is certainly high enough if the drug is to be retained. It is official in the 8th Decennial Revision of the *U.S.P.*

Not Official.

EXTRACTUM LUPULI.—Hops extracted with Alcohol and subsequently with boiling Water by a process similar to that of Extractum Jalapæ.
16 oz. Hops yield 4 to 5 oz. Extract.

Dose.—5 to 15 grains = 0·32 to 1 gramme.
B.P. '85, but omitted in '98; now incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Mex. and Port. have alcoholic Extracts, but not made the same way; U.S. has a **Fluidextract** from Lupulin.

EXTRACTUM LUPULINI.—Lupulin exhausted with Alcohol (90 p.c.) yields about 50 p.c. of Extract.

Dose.—1 to 5 grains = 0·065 to 0·32 gramme.

FLUIDEXTRACTUM LUPULINI.—Prepared with Alcohol (95 p.c.), so that 1 fl. oz. represents 1 oz. of Lupulin.—*U.S.P.*

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

OLEORESINA LUPULINI.—Exhaust Lupulin with Acetone; distil off most of the Acetone on a water-bath, and complete by exposure to the air.—*U.S.P.*

Dose.—1 to 5 grains = 0·065 to 0·32 gramme.
This has been incorporated in the *B.P.C.*

TINCTURA LUPULINI.—Lupulin, 1; Alcohol (90 p.c.), *q.s.* to yield 8.

Dose.—15 to 60 minims = 0·9 to 3·6 c.c.

Not Official.

LYCOPODIUM.

The Spores of *Lycopodium clavatum*, L., and other species of *Lycopodium*; a fine powder, pale yellowish, very mobile, inodorous, tasteless, floating upon Water and not wetted by it, but sinking on being boiled with it, and burning quickly when thrown into a flame.

It has been used in dispensing chiefly as powder to envelop hygroscopic pills.

Recommended in incontinence of urine, and irritability of bladder, in the form of **Tinctura Lycopodii** (1 in 10 of Alcohol 90 p.c.)

Dose.—15 to 60 minims = 0·9 to 3·6 c.c.

Used as a dusting powder for eczema, and to prevent chafing of skin; also as a basis for insufflations and snuffs.

The Tincture has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital. (Licopodio), Jap., Mex. (Licopodio), Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—Lycopodium, when examined under the microscope, should not exhibit Pollen or Starch grains, or particles of sand. It should not leave more than 5 p.c. of ash when ignited with free access of air.

Not Official.

MAGNESIUM.

MAGNESIUM.

Mg, eq. 24·18.

Magnesium, the metallic base of Magnesium salts, does not occur naturally; it is a product of manufacture.

Tests.—Magnesium is a brilliant grey metal, slightly resembling Silver in appearance, malleable, fusible at a low temperature, and convertible into Magnesium Oxide by the combined action of air and moisture. It has a sp. gr. of 1·750; when strongly heated it takes fire and burns, emitting a powerful actinic light and leaving a residue of Magnesium Oxide.

It dissolves readily in diluted mineral acids, yielding solutions which, when neutralised with Ammonia Solution, afford with Sodium or Ammonium Phosphate Solution a white crystalline precipitate, insoluble in Ammonia Solution and in Solution of Ammonium salts, soluble in diluted Hydrochloric Acid. Ammonia Solution, Calcium Potassium or Sodium Hydroxide Solution, affords a white precipitate, insoluble in excess of the reagent but soluble in excess of Ammonium Chloride Solution. Ammonium Carbonate Solution affords no precipitate in the presence of Ammonium Chloride Solution.

MAGNESIA LEVIS.

LIGHT MAGNESIA.

MgO, eq. 40·06.

FR., OXYDE DE MAGNÉSIUM; GER., GEBRANNTE MAGNESIA;
ITAL., OSSIDO DI MAGNESIO; SPAN., OXIDO MAGNESICO.

B.P.Syn.—LIGHT CALCINED MAGNESIA; LIGHT MAGNESIUM OXIDE.

An extremely light, white, inodorous powder, possessing a faintly alkaline taste; prepared from light Magnesium Carbonate by ignition at a dull red heat.

It differs from Heavy Magnesia in that it is about 3½ times lighter.

It is liable to absorb both moisture and Carbonic Anhydride from the air, and should therefore be kept in well-closed glass bottles or jars.

Medicinal Properties.—Same as Magnesia Ponderosa.

Dose.—5 to 30 grains = 0·32 to 2 grammes, if repeated; 30 to 60 grains = 2 to 4 grammes, for a single dose.

Prescribing Notes.—*In* **cachets** *or* **mixtures,** *also taken in Milk. When mixing it with Water, it is desirable to add* 5 *or* 6 *times its weight of Water all at once, to prevent the formation of lumps, which would be difficult to rub down.*

Official Preparation.—Contained in Pulvis Rhei Compositus.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.; Fr. has also Hydroxide de Magnesium.

Tests.—Light Magnesia when dissolved in diluted Sulphuric Acid affords a solution which answers the tests distinctive of Magnesium given under that heading. According to the *U.S.P.* it may be distinguished from Heavy Magnesia by its power of forming a gelatinous Hydroxide when 1 part of the Oxide is mixed with 15 parts of Water. It is not officially required to contain any definite percentage of pure Magnesium Oxide. The *U.S.P.* requires that the recently ignited and cooled Oxide shall contain not less than 96·0 p.c. of pure Magnesium Oxide, as volumetrically determined by the method indicated below. The *P.G.* gives no method of determination.

The more generally occurring impurities are foreign soluble salts, excess of moisture, Aluminium, Calcium, Iron, Carbonates, Chlorides, and Sulphates. The presence of foreign soluble salts may be detected by the test with Litmus and the residue test given in the small type below. Excess of moisture by the loss of weight when the sample is heated to a dull red heat. The *B.P.* states that it should lose little or no weight; the *U.S.P.* allows not more than 15 p.c. as Water of hydration. Aluminium and Iron are indicated by the formation of a precipitate on the addition of Ammonia Solution to a neutralised solution of the Oxide in diluted Hydrochloric Acid, containing an excess of Ammonium Chloride. The *U.S.P.* and *P.G.* give a separate test for Iron with Potassium Ferrocyanide Solution. Calcium is shown by the Ammonium Oxalate test, Carbonates, Chlorides, and Sulphates by the Acetic Acid, Barium Nitrate and Silver Nitrate tests respectively. The *U.S.P.* includes also a test for Arsenic, Copper, Iron, Lead and Zinc with Hydrogen Sulphide, adopting the time-limit test. The omission of tests for both Arsenic and Lead from the official monographs on Magnesium Oxide and Magnesium Carbonate is considered (*C.D.* '08, i. 796) to be really remarkable, highly objectionable quantities of both impurities having been found.

Standards of 4 parts per million for Arsenic and 20 parts per million for Lead have been suggested in this same reference, but it is mentioned that many samples will not pass these standards, and especially is this true of the 'heavy' Oxide. This is the only instance in the paper where standards not readily obtainable are suggested.

Litmus.—If 1 gramme of Magnesium Oxide and 50 c.c. of Water be heated to boiling, cooled and filtered, a filtrate is obtained which should not show more than a faintly alkaline reaction with red Litmus paper, *U.S.P.*

0·2 gramme of Magnesia boiled with 10 c.c. of Water, cooled and filtered, yields a filtrate at most but feebly alkaline in reaction, *P.G.*

Residue.—The filtrate obtained in the preceding *U.S.P.* test when evaporated to dryness should not leave more than 0·04 gramme of residue, *U.S.P.*; 5 c.c. of the filtrate obtained in the preceding *P.G.* test when evaporated should leave only a very insignificant residue, *P.G.*

Acetic Acid.—0·1 gramme of Magnesium Oxide heated to boiling with 5 c.c. of Water, then cooled and poured into 5 c.c. of Acetic Acid, should afford a solution without evolution of more than a few isolated gas bubbles, *U.S.P.*

Ammonium Oxalate.—10 c.c. of a solution of Magnesium Oxide (1–50) prepared by the addition of sufficient Acetic Acid for solution, should not be rendered more than slightly opalescent within 5 minutes by T.S. of Ammonium Oxalate, *U.S.P.*; the filtrate from a mixture of 0·2 gramme of Magnesia and 20 c.c. of water should not become more than opalescent within 5 minutes with T.S. of Ammonium Oxalate, *P.G.*

Potassium Ferrocyanide.—A solution of 1 gramme of Magnesia in 50 c.c. of diluted Hydrochloric Acid and 100 c.c. of Water should be colourless and not give an immediate blue coloration with T.S. of Potassium Ferrocyanide, *U.S.P.* 20 c.c. of an aqueous solution (1–20) prepared with Hydrochloric Acid should not give an immediate blue coloration with T.S. of Potassium Ferrocyanide, *P.G.*

Hydrogen Sulphide.—A solution of 0·4 gramme of Magnesia in 10 c.c. of diluted Acetic Acid should be unaffected by T.S. of Hydrogen Sulphide, *P.G.* A solution (1–20) in diluted Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Barium Nitrate.—A solution in diluted Acetic Acid as above should not become more than opalescent with T.S. of Barium Nitrate, *P.G.*

Silver Nitrate.—A similar solution should not, after the addition of Nitric Acid, become turbid more than opalescent with Silver Nitrate T.S. within 5 minutes, *P.G.*

Volumetric Determination.—If 0·400 gramme of recently ignited and cooled Magnesia be dissolved in 25 c.c. of Normal Volumetric Sulphuric Acid Solution, not more than 5·8 c.c. of Normal Volumetric Potassium Hydroxide Solution should be required for neutralisation, using Methyl Orange T.S. as indicator. 1 c.c. of Normal Volumetric Sulphuric Acid Solution is equivalent to 5 p.c. of pure Magnesium Oxide, *U.S.P.*

Water.—On stirring 1 part of Magnesia with 15 parts of Water in a beaker and allowing the mixture to stand for about half an hour, it will form a gelatinous mass of sufficient consistence to prevent it dropping out when the beaker is inverted. Heavy Magnesia does not readily unite with Water to form a gelatinous Hydroxide, *U.S.P.*

MAGNESIA PONDEROSA.

HEAVY MAGNESIA.

MgO, eq. 40·06.

FR., MAGNÉSIE CALCINÉE PESANTE; GER., SCHWERE GEBRANNTE MAGNESIA.

B.P.Syn.—HEAVY CALCINED MAGNESIA; HEAVY MAGNESIUM OXIDE.

A fine, white powder, without odour, and having an earthy and faintly alkaline taste, prepared by igniting heavy Magnesium Carbonate at a dull red heat; it is specifically heavier than the above.

It is liable to absorb both moisture and Carbonic Anhydride from the air, and should therefore be kept in well-closed glass bottles or jars.

Solubility.—1 in about 6000 of cold Water, 1 in about 36,000 of hot Water; like Lime, it is more soluble in cold than in hot Water.

Medicinal Properties.—Antacid, laxative. Much used in dyspepsia, and to relieve vomiting, heartburn, sick headache, rheumatic and gouty conditions, and other complaints attended with acidity, and in larger doses for constipation. As a laxative, it may often be used with advantage when other medicines occasion nausea; generally combined with other purgatives. It is an excellent and mild purgative for children.

Prescribing Notes.—*It frequently becomes aggregated (on standing) into a solid mass when prescribed in mixtures, especially when given with the Sulphate. Magnesium Carbonate is not open to the same objection.*

Although the heavy powder is preferred by many for its smoothness, the light powder is said to be quicker in its action.

It may be given in Water or in Milk, about twice its weight of either should be added at once, so as to form a smooth paste, before adding the remainder.

Dose.—5 to 30 grains = 0·32 to 2 grammes, for repeated administration; for a single administration, 30 to 60 grains = 2 to 4 grammes.

Incompatibles.—All acids.

Official Preparation.—Permitted in Pulvis Rhei Compositus.

Foreign Pharmacopœias.—Official in Jap., (Magnesia Usta Ponderosa); Norw. and Swed. (Oxydum Magnesicum Ponderosum); U.S. Not in the others.

Tests.—Heavy Magnesium Oxide dissolves readily in diluted Sulphuric Acid forming a solution which answers the tests distinctive of Magnesium given under that heading. It is distinguished from Light Magnesium Oxide by not forming a gelatinous Hydroxide when 1 part of the sample is mixed with 15 parts of Water. It should otherwise conform to the tests given under 'Magnesia Levis.' It is liable to contain the same impurities as the Light Carbonate, and the same methods may be employed for detecting their presence as are described under the Light Oxide.

MAGNESII CARBONAS LEVIS.

LIGHT MAGNESIUM CARBONATE.

$3(\mathbf{MgCO_3}), \mathbf{Mg(HO)_2}, \mathbf{4H_2O}$, eq. 380·65.

FR., HYDROCARBONATE DE MAGNÉSIUM; GER., MAGNESIUMCARBONAT; ITAL., CARBONATO DI MAGNESIO; SPAN., CARBONATO MAGNESICO.

A very light, white, odourless, micro-crystalline powder.

It has been stated that the composition of the substance varies within certain limits and cannot be represented by a definite formula. The Light Carbonate alone is official in the *U.S.P.*, and is stated to have a formula 'approximately' $(MgCO_3), 4Mg\ (OH)_2 + 5H_2O$, eq. 482·26. It is required upon ignition to yield not less than 40 p.c. of residue, of which not less than 96 p.c. should consist of pure Magnesium Oxide.

1 oz. occupies about the space of 6 fl. oz. of Water.

Solubility.—1 in 2500 of cold Water, 1 in 9000 of hot Water.

Medicinal Properties.—Same as Magnesia Ponderosa.

Prescribing Notes.—Same as given under Magnesia Levis.

Dose.—5 to 30 grains = 0·32 to 2 grammes, for repeated administration; for a single administration, 30 to 60 grains = 2 to 4 grammes.

Official Preparation.—Used to prepare Magnesia Levis.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Port., Russ., Span., Swed., Swiss and U.S.

1 oz. occupies about the space of 6 fl. oz. of Water.

Tests.—Light Magnesium Carbonate dissolves readily in diluted mineral acids yielding solutions which afford the tests distinctive of Magnesium given under that heading, and evolving a colourless gas which, when passed into Lime Water, produces a white precipitate, redissolving with effervescence in dilute Hydrochloric Acid, and also soluble in a sufficient excess of the gas. When strongly ignited it is decomposed, yielding Carbonic Anhydride and Water and leaving a residue of Magnesium Oxide. The *B.P.* requirements are that when calcined at a red heat it should leave 42·0 p.c. of residue; the *U.S.P.* and *P.G.* that, when ignited, the residue should amount to not less than 40 p.c. It is not officially required to contain a definite percentage of Magnesium Oxide, and no method is given for the determination, nor is a process given in the *P.G.* The *U.S.P.* requires that it shall contain not less than 96·0 p.c. of pure Magnesium Oxide as determined by the method given in the small type below.

The more generally occurring impurities are foreign soluble salts, Aluminium, Calcium, Iron, other heavy metals, Chlorides and Sulphates. The *B.P.* does not include tests for foreign soluble salts or heavy metals, but includes the rest. The presence of foreign soluble salts may be detected by treating a weighed quantity of 1 gramme of the sample with 50 c.c. of Water and testing its reaction towards Litmus and determining the amount of residue left after filtration and evaporation to dryness, as described in the small type below. The presence of heavy metals, Arsenic, Copper, Lead and Zinc may be shown by Hydrogen Sulphide. Standards of 4 parts per million for Arsenic and 20 parts per million for Lead have been suggested (*C.D.* '08, i.796), but it is mentioned that many samples will not pass these standards. When dissolved in diluted Hydrochloric Acid and a sufficiency of Ammonium Chloride is added, it should yield no flocculent precipitate on the addition of Ammonia Solution in excess indicating the absence of Aluminium. The *U.S.P.* and *P.G.* include a test for Iron with Potassium Ferrocyanide, *see* below. The presence of Calcium, Sulphates and Chlorides, may be shown by the Ammonium Oxalate, Barium Nitrate and Silver Nitrate tests given in the small type below. Commercial samples sometimes contain a considerable proportion of Chlorides.

Residue.—Boiled with Water it gives a liquid which, after filtration and evaporation to dryness, leaves only an insignificant residue, *P.G.* 1 gramme of Magnesium Carbonate when heated to boiling with 50 c.c. of Water should, after cooling and filtering, yield a filtrate which, if evaporated to dryness on a water-bath, should leave a residue of not more than 0·01 gramme, *U.S.P.*

Residue after ignition.—0·5 gramme should, after ignition, yield not less than 0·2 gramme, *P.G.*; 1 gramme should yield 0·40 gramme, *U.S.P.*

Ammonium Oxalate.—10 c.c. of a solution of the salt (1–50) prepared by the addition of sufficient Acetic Acid for solution, should not be rendered more than slightly opalescent within 5 minutes by T.S. of Ammonium Oxalate, *U.S.P.* The residue after ignition of 0·5 gramme of the salt when shaken with

20 c.c. of Water gives a liquid which, after filtration, should not be rendered turbid more than opalescent with Ammonium Oxalate T.S. within 5 minutes, *P.G.*

Potassium Ferrocyanide.—1 gramme dissolved in 20 c.c. of diluted Hydrochloric Acid and 130 c.c. of Water the solution should be colourless, and should not give an immediate blue coloration on the addition of T.S. of Potassium Ferrocyanide, *U.S.P.*

Hydrogen Sulphide.—An aqueous solution (1–20) obtained by means of sufficient Acetic Acid should not be affected by T.S. of Hydrogen Sulphide, *P.G.* A solution obtained by dissolving 1 gramme in 20 c.c. of diluted Hydrochloric Acid and 130 c.c. of Water should not respond to the time-limit test for heavy metals, *U.S.P.*

Barium Nitrate.—An aqueous solution (1–20) as above should not become turbid more than opalescent within 5 minutes with T.S. of Barium Nitrate, *P.G.*

Silver Nitrate.—An aqueous solution (1–20) as above should not, after the addition of Nitric Acid, become turbid more than opalescent within 5 minutes with T.S. of Silver Nitrate, *P.G.*

Volumetric Determination.—If 0·400 gramme of recently ignited and cooled Magnesium Carbonate be dissolved in 25 c.c. of Normal Volumetric Sulphuric Acid Solution, not more than 5·8 c.c. of Normal Volumetric Potassium Hydroxide Solution should be required for neutralisation, Methyl Orange T.S. being used as indicator. 1 c.c. of Normal Volumetric Sulphuric Acid Solution is equivalent to 5 p.c. of pure Magnesium Oxide, *U.S.P.*

MAGNESII CARBONAS PONDEROSUS.

HEAVY MAGNESIUM CARBONATE.

$3(MgCO_3), Mg(HO)_2, 4H_2O$, eq. 380·65.

FR., CARBONATE DE MAGNÉSIUM; GER., WEISSE MAGNESIA; ITAL., CARBONATO DI MAGNESIO; SPAN., CARBONATO MAGNESICO.

An odourless, white, granular powder.

Medicinal Properties.—Same as Magnesia Ponderosa.

Increases blood coagulability.—*L.* '08, i. 96.

Dose.—5 to 30 grains = 0·32 to 2 grammes, for repeated administration; for a single administration, 30 to 60 grains = 2 to 4 grammes.

Prescribing Notes.—*In* cachets, lozenges *or* mixture, *or as Liquor Magnesii Carbonatis. Also given with Magnesium Sulphate as Mistura Alba. When mixing it with Water add at once about twice its weight of Water.*

Official Preparation.—Liquor Magnesii Carbonatis. Used in the preparation of Magnesia Ponderosa and Trochiscus Bismuthi Compositus.

Not Official.—Mistura Alba, Mistura Magnesiæ c. Rheo, Magnesii Bromidi Liquor, and Magnesii Citratis Liquor.

Foreign Pharmacopœias.—Official in Jap.

Tests.—Heavy Magnesium Carbonate dissolves with effervescence in diluted mineral acids yielding solutions which afford the tests distinctive of Magnesium given under that heading, and evolving a colourless gas which produces, when passed into Lime Water, a white precipitate soluble with effervescence in diluted Hydrochloric Acid, and in a sufficient excess of the gas. It should answer the tests given under 'Magnesii Carbonas Levis' and is liable to contain the same impurities. The methods there given for their detection may also be employed in this instance.

Preparation.

LIQUOR MAGNESII CARBONATIS. SOLUTION OF MAGNESIUM CARBONATE. *B.P.Syn.*—FLUID MAGNESIA.

Contains 10 grains of Magnesium Carbonate in 1 fl. oz. of Carbonic Acid Water.

Dose.—1 to 2 fl. oz. = 28·4 to 56·8 c.c.

Swed., Solutio Sulfatis Magnesici Carbonica.

Tests.—Magnesium Carbonate Solution effervesces very slightly when the vessel containing it is first opened. It evolves Carbonic Anhydride when gently warmed, and if the resulting gas be passed into Lime Water it produces a white precipitate. It is officially required to yield upon evaporation to dryness a white residue of pure Hydrous Magnesium Carbonate, which, when calcined, amounts to between 0·80 p.c. and 0·95 p.c. w/v. If this residue be dissolved in diluted Acetic Acid it should answer the tests distinctive of Magnesium given under that heading, and should be free from the impurities mentioned under 'Magnesii Carbonas Levis.' The latter requirement is not contained in the *B.P.*, but it is required to yield no characteristic reaction with the test for Sulphate. The alkalinity of the liquor may be readily determined by direct titration with Normal Volumetric Sulphuric Acid Solution, using Methyl Orange Solution as an indicator of neutrality. 10 c.c. should not require less than 4·6 c.c. equivalent to 0·921 p.c. of MgO, the equivalent of 4 grains of Magnesium Oxide to the oz.

Notwithstanding the above official requirements, commercial samples of the Liquor do not always answer to the official requirements; thus two commercial samples, obtained from well-known makers, yielded the following figures when examined in the author's laboratory:—Specific gravity, 1·022 and 1·024; total solids, 2·07 and 2·34; residue after ignition, 0·94 and 0·93; alkalinity, calculated as Magnesium Oxide, 1·78 and 1·64. The residue from one sample was white, but that from the second sample was distinctly red in colour, due to the presence of Iron.

Not Official.

MISTURA ALBA.—Magnesium Carbonate, 10 grains; Magnesium Sulphate, 1 drm.; Peppermint Water, to 1 fl. oz.—*Given in several Hospital Pharmacopœias.*

This has been incorporated in the *B.P.C.*

MISTURA MAGNESIÆ C. RHEO.—Rhubarb, 5 grains; Magnesium Carbonate, 15 grains; Peppermint Water, 1 fl. oz.

MAGNESII BROMIDI LIQUOR.—Neutralise 20 fl. oz. of Dilute Hydrobromic Acid (10 p.c.) with about 1 oz. of Magnesium Carbonate; filter. Each teaspoonful contains nearly 7 grains of Anhydrous Magnesium Bromide.

Dose.—1 to 2 fl. drm. = 3·6 to 7·1 c.c.

MAGNESII CITRATIS LIQUOR.—SOLUTION OF MAGNESIUM CITRATE. *Syn.* LIMONADE PURGATIVE.—Dissolve 200 grains of Citric Acid in 2 fl. oz. of

Water, and, having added 100 grains of Magnesium Carbonate, stir until it is dissolved. Filter the solution into a strong half-pint bottle, add ½ fl. oz. of Syrup of Lemons and sufficient Distilled Water to nearly fill the bottle, then introduce 40 grains of Potassium Bicarbonate in crystals, and immediately close the bottle with a cork, which should be secured with string or wire; afterwards shake the bottle until the Potassium Bicarbonate is dissolved.

A pleasant saline aperient and refrigerant draught.

Dose.—5 to 10 fl. oz. = 142 to 284 c.c.

Magnesium Carbonate, 15; Citric Acid, 33; Syrup of Citric Acid,* 60; Potassium Bicarbonate, 2·5; Water, *q.s.* to make about 360.—*U.S.P.*

This has been incorporated in the *B.P.C.*

* **Syrup Acidi Citrici.**—Citric Acid, 1; Distilled Water, 1; Tincture of Fresh Lemon Peel, 1; Syrup, *q.s.* to produce 100.—*U.S.P.*

Foreign Pharmacopœias.—Official in the U.S. formula modified. Austr. and Hung. (Potio Magnesiæ Citricæ Effervescens); Austr. has also Magnesium Citricum Effervescens; Belg. (Magnesii Citrici Potio); Dutch (Solutio Citratis Magnesici); Fr. (Limonade Citro-Magnésienne); Ital. (Limonata Magnesiaca); Mex. (Solucion de Citrato de Magnesia); Port. (Limonada Citro-Magnesica); Russ. (Potio Magnesii Citrici Aërophora); Span. (Pocion de Citrato Magnesico Gaseosa), also Pocion de Citrato de Magnesia; Ger., Jap. and Swiss (Magnesium Citricum Effervescens). Swiss has also Limonata aerata laxans. Not in the others. Fr. has also Citrate de Magnesie desséché.

MAGNESIUM LACTATE.—Valuable for combating the accidents of hæmophilia in cases where the Calcium salts do not seem to act. Dose, 40 to 60 grains once or twice repeated. The large dose unfits it for delivery in a mixture; it should be dissolved in hot Water by the patient himself.—*L.* '08, i. 96.

MAGNESII SULPHAS.

MAGNESIUM SULPHATE.

B.P.Syn.—EPSOM SALT.

$MgSO_4, 7H_2O$, eq. 244·68.

FR., SULFATE DE MAGNÉSIUM; GER., MAGNESIUMSULFAT; ITAL., SOLFATO DI MAGNESIO; SPAN., SULFATO MAGNESICO.

Small, colourless, odourless, translucent, rhombic prisms or acicular crystals, having a bitter, saline taste.

It is generally obtained by purification of native Magnesium Sulphate (Kieserite) or from native Magnesium Carbonates (Magnesite or Dolomite) by decomposition with Sulphuric Acid and recrystallisation.

It is liable to effloresce on exposure to dry air, and should therefore be kept in well-closed bottles or jars.

Solubility.—10 in 13 of Water, measures 18; 20 in 3 of boiling Water; insoluble in Alcohol (90 p.c.).

Medicinal Properties.—A mild and safe hydragogue purgative, operating with little pain or nausea. Used in portal congestion and chronic constipation and that of lead poisoning, in inflammatory affections in robust people, in dropsies, and in congestion of brain;

by reducing blood pressure, it wards off apoplectic attacks; along with Ferrous Sulphate it is given in anæmia. It is an important ingredient in Mistura Alba. In the acute form of either the bacillary or the amœbic variety of dysentery, drm. doses are given every hour.

When given in conjunction with Diluted Sulphuric Acid the dose may be reduced; the Acid also helps to cover the nauseous taste.

Successful treatment of tetanus by intraspinal injections of a 25 p.c. solution. —*L.* '07, ii. 910.

Dose.—30 to 120 grains = 2 to 8 grammes, for repeated administration; for a single administration, ¼ to ½ oz. = 7·1 to 14·2 grammes.

Prescribing Notes.—*Usually given in solution. It has a very unpleasant bitter taste which is difficult to mask; Sodium Sulphate is much more palatable. It is usually prescribed with Cinnamon Water or Peppermint Water, and Spirit of Chloroform.*

Mixtures containing Magnesium Sulphate, Phenazone, and a Salicylate throw down a bulky crystalline deposit, which has been stated to consist of Phenazone Salicylate, but has also been shown to yield a fairly definite percentage of Magnesium Oxide on ignition.—*P.J.* '99, ii. 332; '02, i. 22, 50, 143.

Incompatibles.—Potassium and Sodium Carbonates and Bicarbonates, Lime Water, Lead Acetate. Magnesium Sulphate should not be prescribed with Tartarated Soda, for after some time Magnesium Tartrate will precipitate. The following prescription is an example: ℞ Sodæ Tartaratæ, ʒj; Magnes. Sulph., ʒij; Aquæ ad. fl. ℥iss.

Official Preparation.—Magnesii Sulphas Effervescens. Contained in Mistura Sennæ Composita. Used in the preparation of Magnesii Carbonas Levis, Magnesii Carbonas Ponderosa, and Liquor Magnesii Carbonatis.

Not Official.—Eau Saline Purgative, Eau Saline Purgative Gazeuse, Enema Magnesiæ Sulphatis, Magma Magnesiæ, Mistura Salina Laxans, Magnesii Benzoas, Magnesii Salicylas and Magnesii Sulphis.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—Magnesium Sulphate when exposed to warm air loses a portion of its Water of crystallisation and is converted into a white powder. At a temperature of 50° to 52° C. (122° to 125·6° F.) it loses one of its seven molecules of Water of crystallisation, equivalent to a loss of weight of 7·3 p.c. At a temperature between 120° to 130° C. (248° and 266° F.) it loses six molecules of Water, equivalent to a loss of weight of 43·8 p.c., and at a temperature of 200° to 230° C. (392° to 446° F.) it loses the remaining molecule of Water, equivalent to a total loss of weight of 51·1 p.c., the salt being rendered anhydrous. 244·68 parts of crystallised Magnesium Sulphate yielding 119·52 parts of anhydrous Magnesium Sulphate or 100 parts of the crystalline yield 48·9 parts of the anhydrous salt.

It dissolves readily in Water, yielding a solution which is neutral in reaction towards Litmus paper, and which affords the tests distinctive of Magnesium given under that heading. Its aqueous solution gives on the addition of Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid. It is officially required to indicate 97·36 p.c. of pure crystallised Magnesium Sulphate, as determined by precipitating the Magnesium as Magnesium Ammonium Phosphate from a solution of 0·5 gramme of the salt in 250 c.c. of Water, by the addition of a mixture of Ammonium Chloride, Ammonia and Ammonium Phosphate Solutions. The mixture is allowed to remain at rest for 12 hours, the precipitate is then filtered off, washed, dried, ignited, and when cool weighed as Magnesium Pyrophosphate. It should weigh 0·22 gramme. The *U.S.P.* requires that the salt shall contain not less than 99·7 p.c. of pure crystalline Magnesium Sulphate, but gives no method of determination. The *P.G.* does not give either a requisite percentage or a method of determination.

The more generally occurring impurities are Aluminium, Ammonium, Arsenic, Calcium, Iron, Potassium, Sodium and Zinc, Chlorides and Nitrates. Ammonium salts may be detected by boiling the sample with Liquor Potassæ, when no odour of Ammonia should be evolved. Aluminium and Iron may be detected by the formation of a gelatinous precipitate when the aqueous solution is mixed with a sufficient quantity of Ammonium Chloride and Ammonia Solution is added to the mixture. The *P.G.* gives a separate test for Iron with Potassium Ferrocyanide. The *P.G.* employs the Bettendorf's test for Arsenic with Stannous Chloride Solution, the *U.S.P.* the modified Gutzeit's test. The *B.P.* does not admit Arsenic as a possible impurity, notwithstanding its probable presence in Sulphuric Acid. Copper, Lead, and Zinc, the two former of which are not included in the *B.P.*, may be recognised by Hydrogen Sulphide in either acid or alkaline solution. Potassium and Sodium may be tested for in the filtrate after the removal of other metals. Chlorides and Nitrates are examined for by the usual tests.

Stannous Chloride.—A mixture of 1 gramme of powdered Magnesium Sulphate and 3 c.c. of Stannous Chloride T.S. should not assume a dark colour in the course of an hour, *P.G.*

Hydrogen Sulphide.—An aqueous solution (1–20) should be unaffected by T.S. of Hydrogen Sulphide, *P.G.* 10 c.c. of a 1 in 20 aqueous solution should not respond to the time-limit test for heavy metals, *U.S.P.*

Gutzeit's Test.—5 c.c. of an aqueous solution (1–10) should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Silver Nitrate.—An aqueous solution (1–20) should not become more than opalescent within 5 minutes with T.S. of Silver Nitrate, *P.G.*

Potassium Ferrocyanide.—20 c.c. of an aqueous solution (1–20) should not give a blue colour with 0·5 c.c. T.S. of Potassium Ferrocyanide, *P.G.*

Turmeric.—Let 2 grammes of Magnesium Sulphate be finely rubbed down with 2 grammes of Calcined Marble which has been previously slaked. Introduce the powder into a mixture of 10 c.c. of Alcohol and 10 c.c. of Water, and set aside for two hours with frequent agitation. Then let 40 c.c. of Absolute Alcohol be added, and filter. 20 c.c. of the filtrate should not give any red coloration on the addition of 2 c.c. of Tumeric Tincture, *P.G.*

Preparation.

MAGNESII SULPHAS EFFERVESCENS. Effervescent Magnesium Sulphate. *B.P. Syn.*—Effervescent Epsom Salt.

Magnesium Sulphate, dried at 130° F. (54·4° C.), 77; Sodium Bicarbonate, in powder, 72; Tartaric Acid, in powder, 38; Citric Acid, in powder, 25; Refined Sugar, in powder, 21; make into granules. (about 1 in 2)

Dose.—60 to 240 grains = 4 to 16 grammes, for repeated administration; for a single administration, ½ to 1 oz. = 14·2 to 28·4 grammes.

Foreign Pharmacopœias.—U.S., Magnesium Sulphate, crystals, 50; Dried Sodium Bicarbonate, 40·3; Dried Tartaric Acid, 21·1; Citric Acid, in crystals, 13·6. A granular, effervescent **citrate** is Official in Belg., Ital., Russ. and Span.

Not Official.

EAU SALINE PURGATIVE (Fr.).—Magnesium Sulphate, 1; Sodium Sulphate, 1; Distilled Water, 65. Dissolve and filter.

EAU SALINE PURGATIVE GAZEUSE. Eau dite de Sedlitz (Fr.).—Dissolve 30 of Magnesium Sulphate and 4 of Sodium Bicarbonate in 650 of Water, filter the solution into a bottle, add 4 of Tartaric Acid in crystals, cork, and tie over. This preparation is also made with 45 and with 60 of Magnesium Sulphate, but when no quantity is indicated, the 30 as above should be used.

ENEMA MAGNESII SULPHATIS.—Magnesium Sulphate, 1; Olive Oil, 1; Mucilage of Starch, 15. Dissolve the Magnesium Sulphate in the Mucilage, add the Oil and mix.—*B.P.* 1885, omitted in *B.P.* 1898.

This has been incorporated in the *B.P.C.*

MAGMA MAGNESIÆ.—Magnesium Sulphate, 25; Sodium Hydroxide, 8·1; Water, *q.s.* to produce 100. Dissolve the Magnesium Sulphate in 400 of Water and Sodium Hydroxide in another portion of 400 of Water, and filter the solutions. Pour the Sodium Hydroxide Solution slowly, in a thin stream, into the Magnesium Sulphate Solution, with constant stirring. Allow the precipitate to subside and decant the clear fluid. Wash the Magma several times with Water by decantation until the washings are free from saline taste. Transfer the Magma to a muslin strainer and allow to strain without pressing. Then re-transfer it to suitable vessels and add sufficient Water to make 100 of fluid, and mix thoroughly by stirring. One teaspoonful contains about 3 grains of Magnesium Hydroxide. Average Dose.—2 fl. drm. = 7·1 c.c.—*U.S.N.F.*

Note.—The Water used in preparing this must be free from organic matter or the Magma will become discoloured.

A similar preparation with directions closely resembling the above appears in the *B.P.C.* under the title **Emulsio Magnesiæ** (Magnesia Milk), but Solution of Potassium Hydroxide is used in place of Sodium Hydroxide, and it is about half the strength of Magnesia; there is also a note to the effect that a more concentrated preparation, **Magma Magnesiæ** or Cremor Magnesiæ, may be prepared by doubling the proportion of Magnesium Sulphate which is the strength of the **Magma Magnesiæ** of the *U.S.N.F.*; the form given below is incorporated in the *B.P.C.*

Magnesium Sulphate, 12·50; Solution of Potassium Hydroxide, 114; Distilled Water, *q.s.* to make 100. General directions are the same as above.

MISTURA SALINA LAXANS.—Magnesium Sulphate, 30 grains; Potassium Citrate, 20 grains; Tincture of Hyoscyamus, 15 minims; Chloroform Water, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

MAGNESII BENZOAS $Mg(C_7H_5O_2)_2,3H_2O$, eq. 318·08.—A white, crystalline powder, soluble 1 in 30 of Water; sparingly in Alcohol (90 p.c.). Introduced as an antipyretic.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Tests.—Magnesium Benzoate dissolves in Water, yielding a solution which is neutral or only faintly acid towards Litmus paper. It yields on the addition of Ferric Chloride T.S. a buff-coloured precipitate. The concentrated aqueous solution affords when acidified with Hydrochloric Acid a white crystalline precipitate, which, when separated, washed free from mineral acid and carefully dried, should possess the m.p. and answer the tests given under 'Acidum Benzoicum.' The filtrate after the removal of the Benzoic Acid should respond to the tests for Magnesium given under that heading and should be free from the impurities given under 'Magnesia Levis.'

MAGNESII SALICYLAS $Mg(C_7H_5O_3)_2,4H_2O$, eq. 367·72.—Colourless, silky needles, or as a white, crystalline powder. Soluble 1 in 6 of Water; 1 in 167 of Alcohol (90 p.c.).

It should be kept in well-closed glass bottles of a dark amber tint.

Dose.—50 to 100 grains = 3·24 to 6·48 grammes daily have been given with advantage in typhoid fever.—*L.M.R.* '88, 62; *P.J.* (3) xviii. 823; *T.G.* '88, 390.

Frequently of a pink colour, due to a trace of Iron, which may be removed by the previous treatment of the Magnesium Sulphate, as described.—*P.J.* '95, ii. 178; *C.D.* '95, ii. 356.

Official in Mex.

Tests.—Magnesium Salicylate dissolves in Water, forming a solution which is acid in reaction towards blue Litmus paper. The aqueous solution of the salt yields on the addition of Ferric Chloride T.S. a deep violet coloration. A sufficiently concentrated solution yields on the addition of Hydrochloric or Sulphuric Acid a white crystalline precipitate, which, when separated, washed free from mineral acid and carefully dried, possesses the m.p. and answers the tests given under 'Acidum Salicylicum.' The filtrate after the removal of the Salicylic Acid should answer the tests characteristic of Magnesium given under that heading; it should also be free from the impurities given under 'Magnesii Carbonas Ponderosus.' When a measured quantity of 10 c.c. of a 10 p.c. aqueous solution of the salt is shaken with an equal quantity of Ether, and the ethereal solution is separated and allowed to evaporate spontaneously, only an infinitesimal residue should remain.

MAGNESII SULPHIS $MgSO_3,6H_2O$, eq. 210·92.—A white, crystalline powder.

As it is liable to become oxidised on exposure to the air it should be kept in well-stoppered bottles. It should also be kept in a cool atmosphere.

Solubility.—1 in 100 of Water; insoluble in Alcohol (90 p.c.). Given in the place of Sodium Sulphite.

Dose.—20 to 30 grains = 1·3 to 2 grammes.

Tests.—Magnesium Sulphite loses its Water of crystallisation when heated to a temperature of 200° C. (392° F.), and when more strongly heated it is converted into a mixture of Magnesium Sulphate and Oxide. The aqueous solution yields on the addition of Barium Chloride Solution a white precipitate partially soluble in Hydrochloric Acid, with evolution of the characteristic odour of Sulphur Dioxide, and leaving a small quantity of white deposit quite insoluble in Hydrochloric Acid. It should answer the tests distinctive of Magnesium given under that heading. The aqueous solution readily decolorises Iodine Solution. If a weighed quantity of 1 gramme of the salt dissolved in 100 c.c. of Water be mixed with 1 gramme of Iodine dissolved in Potassium Iodide Solution, and 5 c.c. of diluted Sulphuric Acid be gradually added, shaking after each addition, the liquid obtained on filtration should be free from yellow colour.

It should be free from the impurities mentioned under 'Magnesii Carbonas Levis,' and when dissolved in four times its volume of diluted Sulphuric Acid it should form a clear solution not becoming turbid for some time, indicating the absence of Thiosulphate as an impurity.

Not Official.

MANGANESII OXIDUM PRÆPARATUM.

Digest finely-powdered commercial Black Oxide in Diluted Hydrochloric Acid for 24 hours, frequently shaking the bottle containing them; then pour off the Acid; wash the Oxide thoroughly with Water, pouring off the lighter portions each time for use, and rejecting the heavier and coarser particles; finally dry on a water-bath.

Precipitated Manganese Dioxide is official in the 8th Decennial Revision of the *U.S.P.*, replacing the native Black Manganese Oxide of the *U.S.P.* 1890. It is stated to consist mainly of Manganese Dioxide, with small amounts of other Manganese Oxides, and corresponding to not less than 80 p.c. of Manganese Dioxide. It forms a fine, heavy, black, odourless and tasteless powder, insoluble in Water and in Alcohol (90 p.c.); insoluble in cold Sulphuric Acid, but undergoing conversion into Manganous Sulphate when heated, with simultaneous evolution of Oxygen.

Used for gastrodynia, pyrosis, and as an emmenagogue.

Dose.—10 to 30 grains = 0·65 to 2 grammes.

Foreign Pharmacopœias.—Official in Fr. (Bioxyde de Mangenèse); Mex. (Manganesa); Russ.; Span. (Manganesa); Swiss (Manganum Hyperoxydatum); and U.S. (Mangani Dioxidum Præcipitatum. Fr. and Mex. have also Carbonato de Manganeso.

Tests.—Manganese Dioxide, when heated with Hydrochloric Acid, evolves a greenish-yellow gas, which first reddens, and then bleaches, blue Litmus paper, and which immediately liberates Iodine from Potassium Iodide Solution. When heated to a strong red heat it evolves Oxygen, which may be recognised by its rekindling the glowing end of a strip of wood when inserted in the containing vessel. When fused with a mixture of Potassium Hydroxide and Chlorate it yields a dark green mass which affords a green solution in water; this solution changes to purplish-red on boiling or on the addition of diluted Sulphuric Acid. The *U.S.P.* requires that it shall indicate not less than 80 p.c. of pure Manganese Dioxide as volumetrically determined by dissolving a weighed quantity of 0·2 gramme of the Oxide in a mixture of 50 c.c. of Tenth-normal Volumetric Oxalic Acid and 3 c.c. of Sulphuric Acid. When this solution is diluted with warm Water to 100 c.c. it should not require more than 13 c.c. of Tenth-normal Volumetric Potassium Permanganate Solution to produce a pink tint.

It should not evolve an odour of Hydrogen Sulphide when mixed with Hydrochloric Acid, nor should filter paper moistened with Lead Acetate Solution be blackened when held over the tube in which the mixture is contained. If a small quantity of the Oxide be boiled with a sufficiency of Hydrochloric Acid, cooled and filtered, the filtrate should yield no orange-coloured precipitate on the addition of Hydrogen Sulphide.

MANGANESII HYPOPHOSPHIS $MnP_2H_4O_4,H_2O$, eq. 201·52.—A pale pink granular powder, soluble 1 in 7 of Water.

The salt is official in the *U.S.P.*, and is required to contain not less than 97 p.c. of pure Manganous Hypophosphite.

Used in the preparation of Syrupus Hypophosphitum Compositus.

Tests.—Manganese Hypophosphite, when strongly heated, evolves spontaneously inflammable Hydrogen Phosphide gas, and leaves a residue of Manganese Pyrophosphate. The sslt dissolves in Water, forming a solution which is acid in reaction towards blue Litmus paper, and which affords the tests distinctive of Manganese given under 'Manganesii Sulphas.' A 5 p.c. aqueous solution of the salt acidified with Hydrochloric Acid yields, on the addition of Mercuric Chloride Solution, first a white precipitate of Mercurous Chloride, changing on further addition to a greyish precipitate of metallic Mercury.

The more generally occurring impurities are Arsenic, Calcium, Carbonate, Phosphate and Sulphate. It should not respond to the modified Gutzeit's test for Arsenic. If, after separation of the Manganese by boiling with Potassium Hydroxide Solution, the filtered liquid be first acidified with Hydrochloric Acid and then made alkaline by the addition of Ammonia Solution, it should afford no precipitate with either Magnesium Ammonio-sulphate Solution or with Ammonium Oxalate Solution indicating the absence of Phosphate and Calcium. The aqueous solution should not effervesce on the addition of diluted Hydrochloric Acid, and Barium Chloride Solution should not cause more than an opalescence indicating the absence of Carbonate and of more than a trace of Sulphate.

MANGANESII PHOSPHAS $Mn_3P_2O_8,7H_2O$, eq. 477·36.—A whitish powder, prepared by precipitating a Manganous salt with Sodium Phosphate.

Used to replace part of the Iron of Ferrous Syrups to form a compound Syrup.

Tests.—Manganese Phosphate when fused with a mixture of Potassium and Sodium Carbonates and some Potassium Nitrate, yields a dark green residue, which gives a green-coloured solution when dissolved in Water. When dissolved in diluted Hydrochloric Acid it answers the tests distinctive of Manganese given under that heading. When acidified with Nitric Acid it yields, on the addition of Ammonium Molybdate Solution, a yellow precipitate.

The freshly precipitated salt which has been dried without heat corresponds with the formula given, which is equivalent to a theoretical loss on ignition of 26 p.c., but commercial samples seldom lose on ignition more than 20 p.c.

MANGANESII SULPHAS $MnSO_4·4H_2O$, eq. 221·38. Colourless or pale rose coloured, right rhombic prisms, possessing a somewhat bitter and an astringent taste.

As it is slightly efflorescent it should be kept in well-closed glass bottles and in a cool atmosphere.

It is official in the *U.S.P.*, and is required to contain not less than 99·5 p.c. of pure crytallised Manganous Sulphate.

Solubility.—7 in 10 of Water; insoluble in Alcohol (90 p.c.).

Medicinal Properties.—Purgative; it is, however, little used, being uncertain in its action and apt to cause vomiting; its taste is disagreeably styptic.

Dose. 1 to 5 grains = 0·065 to 0·32 gramme, as a tonic; 30 to 60 grains = 2 to 4 grammes, as a purgative.

Foreign Pharmacopœias. Official in Fr., Mex., Port., Span. and U.S. Not in the others. Fr. has also Protochlorure de Manganese.

Tests.—Manganese Sulphate when heated loses its Water of crystallisation and is converted into the anhydrous salt. When fused with a mixture of Potassium and Sodium Carbonates and some Potassium Nitrate it leaves a dark green residue, which yields a green-coloured solution when dissolved in Water. It dissolves readily in Water, yielding a solution which is neutral or only faintly acid in reaction towards Litmus paper. This solution affords with Ammonium Hydrosulphide Solution a pale pinkish-coloured precipitate, soluble in diluted mineral acids with evolution of Hydrogen Sulphide; with Potassium Ferrocyanide Solution it yields a reddish-white precipitate; and with Barium Chloride Solution a white precipitate insoluble in diluted Hydrochloric Acid. When gently ignited in a porcelain crucible it should leave not less than 67·35 p.c. of residue, indicating not less than 99·5 p.c. of pure crystallised Manganous Sulphate.

The more generally occurring impurities are Iron, Arsenic, Copper, Lead and Zinc, salts of the alkali metals, Magnesium, and excess of Water. The aqueous solution should not be coloured distinctly blue by Potassium Ferrocyanide Solution. The *U.S.P.* employs Potassium Sulphocyanate Solution as a test for Iron, previously boiling with a few drops of Hydrochloric Acid and a few drops of Chlorine Water. Hydrogen Sulphide should produce no dark coloration nor a precipitate in the aqueous solution acidified with Hydrochloric Acid, nor should the same reagent affect a solution of 1 gramme of the salt, 1 gramme of Sodium Acetate and a few drops of Acetic Acid. If the aqueous solution be completely precipitated by the addition of Ammonium Carbonate Solution and the filtrate be carefully evaporated to dryness and ignited, no weighable residue should remain. The salt loses when gently ignited not more than 32·65 p.c. of moisture. The *U.S.P.* figure is equivalent to 32·3 p.c., which corresponds with a salt containing 100 p.c. of pure Manganous Sulphate, and not with the *U.S.* official requirements of not less than 99·5 p.c. of the pure salt.

Manganesii et Sodii Citras and **Manganesii et Ferri Citras** are salts readily soluble in Water, and have been used as tonics in doses of 1 to 5 grains = 0·06 to 0·32 gramme.

Not Official.

MANNA.

A concrete saccharine exudation, obtained by transverse incision from the Stems of *Fraxinus Ornus*, L., and *F. rotundifolia*, Lam., and probably other forms of this; cultivated chiefly in Sicily.

Manna is official in the *U.S.P.* and in *P.G.*

Solubility.—1 in 5 of Water; 1 in 150 of Alcohol (90 p.c.).

Medicinal Properties.—A mild laxative; in large doses apt to cause flatulence and griping pain; useful for children and delicate females, given in hot milk or in combination with other purgatives, such as Senna.

Dose.—As a laxative, 60 grains to 1 oz. = 4 to 28·4 grammes.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Fr., Ger., Hung., Ital., Jap., Mex. (Mana), Norw., Port., Russ., Span., Swed., Swiss and U.S.

Descriptive Notes.—The best manna is known as Flake Manna. It occurs in pieces 3 inches (75 mm.) or more in length, about an inch (25 mm.) in diameter and ¼ inch (6 mm.) or more in thickness, concave on the inner side and rough or coarsely striated and tuberculated on the outer surface; it is of a yellowish, pale brownish, or nearly white colour, of a sweet taste, with a very faint acridity and bitterness, porous and crystalline in fracture. Inferior qualities, known as "Small flake" or "Sorts," are much smaller, darker in colour, softer and more glutinous, especially if obtained from older trees.

The larger and better kinds are called Flake Manna, and consist principally (60 to 80 p.c.) of Mannite, $C_6H_8(HO)_6$, eq. 180·74, together with Sugar and extractive matter. Contains about 10 p.c. of moisture.

Pure Mannite is easily crystallised from an alcoholic Solution. It cannot be fermented by Yeast. It does not reduce Fehling's Solution, and gives no brown colour with boiling Solution of Potash.

Official in Dutch and Ital.

Tests.—Manna, when boiled with 20 volumes of Alcohol (94·9 p.c.) and filtered, yields a filtrate which rapidly deposits crystals of Mannite on cooling. The *P.G.* requires that a solution of 2 grammes of Manna in an equal weight of Water, when mixed with 10 times its weight of Absolute Alcohol, raised to the boiling point and filtered through a pledget of Cotton-Wool, shall leave at least 1·5 gramme of residue after evaporation of the Alcohol.

MANNA DEPURATA.—Dissolve Manna, 10, in sufficient Water; strain and evaporate to 10. It is convenient for dispensing, and keeps good for a long time.

SYRUPUS MANNÆ.—Dissolve 10 of Manna in 2 of Alcohol (90 p.c.) and 33 of Water previously mixed together; filter, and to the filtrate add 25 of Sugar to make 100 of Syrup; all by weight.—*Ger.* and *Jap.*

This has been incorporated in the *B.P.C.*, which, however, uses 2·5 (by weight) of Alcohol (90 p.c.) in place of 2 in the formula given above.

Official in Mex. and Russ. with different proportions.

SYRUPUS MANNÆ COMPOSITUS.—10 of Senna and 1 of Fennel, macerate in 60 of Water for 24 hours; strain and evaporate the fluid to 40, and dissolve in it, whilst hot, 10 of Manna; when cold add 5 of Alcohol (90 p.c.). After 24 hours pour off the clear fluid, add an equal weight of Sugar, and boil to form a syrup.—*Swiss.*

This has been incorporated in the *B.P.C.* as follows:—

Syrupus Mannæ Compositus.—Macerate 10 of Senna leaves and 1 of Fennel in 60 of the Water for 24 hours, press; filter, and evaporate to 30, then add 6 of Alcohol (90 p.c.). Allow to stand for 6 hours, filter, and dissolve in the filtrate then 10 of Manna and 55 of Sugar, finally making up to the required weight with Water if necessary.

MANNITOL HEXANITRATE (Hexanitrin).—Odourless, crystalline, white needles, slightly soluble in Water, soluble in Alcohol and Ether. The nitrate of the hexatomic alcohol, Mannite. It explodes violently on being triturated or struck, and therefore requires great care in handling. Introduced as a vaso-dilator, stated to possess same action as the Erythrol compound, though not so powerful.—*B.M.J.* '95, ii. 1213; '98, i. 529, 893.

Dose.—1½ to 2 fl. drm. = 5·4 to 7·1 c.c. of a 1 p.c. alcoholic Solution.

Not Official.

MARANTA.

ARROW-ROOT.

The Starch obtained from the Roots of *Maranta arundinacea*, L., a native of the tropical parts of America and the West Indies; that from Bermuda being considered the best.

A light, white powder, or small pulverulent masses, free from unpleasant odour and taste.

Medicinal Properties.—Nutrient and demulcent, frequently taken with Milk. It should be first made into a thin paste with cold Milk, and boiling Milk added to make a thick mucilage.

Foreign Pharmacopœias.—Official in Mex. (Arroru) and Port. (Araruta).

Not Official.

MASTICHE.

MASTICH.

A concrete, resinous exudation, obtained by incisions in the bark of the stem and large branches of *Pistacia Lentiscus*, L., occurring as small, irregular, pale yellow tears, brittle, and either opaque or, far more frequently, transparent. Sp. gr. 1·06 to 1·07.

Produced in the Island of Scio.

Solubility.—Insoluble in Water; partly soluble in Alcohol (90 p.c.) and Oil of Turpentine; 2 in 1 of Ether; 2 in 1 of Chloroform.

Medicinal Properties.—Used in solution as a temporary stopping for teeth.

Foreign Pharmacopœias.—Official in Belg., Norw., Swed. (Resina Mastix), Dutch, Hung., Port., Mex. and Span. (Almaciga) and U.S.

MASTIC DENTAIRE.—Mastic 2, Ether 1. Dissolve.

Cotton saturated in this solution is a good stopping for decayed teeth.

MASTIC AND CHLOROFORM.—Mastic 2, Chloroform 1. Dissolve. Used for the same purpose as above.

Not Official.

MATICO.

The dried Leaves of *Piper angustifolium*, Ruiz and Pavon. Imported from South America.

Medicinal Properties.—An agreeable aromatic astringent, used in all forms of inflammation of the urinary passages, and especially in catarrh of the bladder of the aged. The Volatile Oil has a powerful styptic property, and a solution of it is applied to leech-bites and other small bleeding wounds.

Dose.—Of the powder, 30 to 120 grains = 2 to 8 grammes, three times daily.

Foreign Pharmacopœias.—Official in Belg., Mex., Port. and U.S. Not in the others.

Descriptive Notes.—The dried leaves as imported from Panama are usually much bent and broken, but in the perfect state are elongate lanceolate, with a rounded, cordate, oblique base, 3½ to 6 inches (9 to 15 cm.) long and 1¼ to 1½ inches (31 to 37 mm.) broad, entire at the margins, with a short leafstalk about ½ inch (12 mm.) long, brittle. The veins and veinlets are deeply sunk on the upper surface so as to give a tesselated appearance, and are prominent below, where they form a reticulated network, and densely hairy. The odour is faintly aromatic, and the taste gritty and bitterish. A much larger and broader leaf is occasionally received from Columbia, which possesses a similar surface, but the species that yields it has not been determined. The microscopic features are the short rough hairs, the hypodermal cells of the upper surface, the oil glands and the hypodermal collenchyma above and below the nerve.

The leaves of other species of *Piper*, *e.g.* (*Piper aduncum*, L., and *P. anisatum*, H. B. and K.) are sometimes mixed with those of true Matico, but neither of these possesses the tesselated nervation of the leaves.

INFUSUM MATICO.—Matico Leaves, cut small, 1; boiling Distilled Water, 20. Infuse half an hour and strain.

Dose.—1 to 4 fl. oz. = 28·4 to 113·6 c.c.

FLUIDEXTRACTUM MATICO.—100 of Matico in No. 40 powder is moistened with 30 of a mixture of Alcohol (95 p.c.) 75 and Water 25; packed in a percolator and macerated for 48 hours, then gradually exhausted with the menstruum. Reserve the first 85, and evaporate the remainder to a soft extract, which dissolve in the reserved portion, and make up with the menstruum to 100. —*U.S.P.*

This has been incorporated in the *B.P.C.*

Official in Mex., 1 in 1.

TINCTURA MATICO.—Matico Leaves, in coarse powder, 1; Alcohol (60 p.c.), 5. Macerate 14 days, strain, express, and filter. (1 in 5)

Dose.—1 to 2 fl. drm. = 3·6 to 7·1 c.c.

Foreign Pharmacopœias.—Official in Mex., 1 in 5. Not in the others.

Not Official.

MEDULLA RUBRA.

RED BONE-MARROW.

The Marrow of ox-bones, being a seat of formation of blood corpuscles, has been introduced in the treatment of pernicious anæmia, chlorosis, and hæmoglobinuria. It may be given fresh or raw, spread as a sandwich, also in the form of '**Glycerin Extract,**' in gelatin **capsules,** or as **tablets.**—*B.M.J.* '94, i. 1172; '95, i. 1084.

Red Marrow did not have the slightest effect in three cases of pernicious anæmia, one of which began rapidly to improve on treatment with arsenic.—*L.* '96, i. 285.

Good results in splenic leucocythemia.—*B.M.J.* '96, i. 840, 956.

Fr. has Moelle de Bœuf purifiée, Medulla Bovis depurata.

GLYCERIN EXTRACT OF RED BONE-MARROW.—Veal Marrow, 1; Chloroform Water, 2; Glycerin, 2. Beat up the Marrow with the Glycerin, and add the Chloroform Water, beating the whole together frequently during 1 hour; then strain, and make up to 4 with a mixture of Chloroform Water and Glycerin in equal parts. 4 fluid parts equal 1 part of Marrow.—*P.J.F.*

Extractum Medullæ Rubræ. *Syn.* Medullary Glyceride; Glycerin Extract of Red Bone-Marrow.—Red Bone-Marrow, 25; Chloroform Water, 50; Glycerin, 50.—*B.P.C.*

MEL DEPURATUM.

CLARIFIED HONEY.

FR., MIEL BLANC; GER., GEREINIGTER HONIG; ITAL., MIELE DEPURATO; SPAN., MIEL DEPURADA.

Honey of commerce, melted in a water-bath, and strained, while hot, through flannel previously moistened with warm Water.

Medicinal Properties.—Demulcent, laxative, and nutritive, but apt to gripe and occasion flatulence when given in large doses. In the form of **Oxymel** it is a useful addition to gargles and cough-mixtures, as it relieves the pain and dryness of the throat and also dysphagia.

Official Preparations.—Mel Boracis, Oxymel, Oxymel Scillæ. Contained in Confectio Piperis.

Not Official.—Aqua Mellis.

Foreign Pharmacopœias.—Official in all; Port., Mellito Simples; Span., Miel Depurado.

Descriptive Notes.—Honey is largely imported from California, Chili and Jamaica, and to a less extent from France, Italy, New Zealand, and other countries. Formerly the white, delicately-flavoured Narbonne Honey imported from France was considered the best, but very white and good-flavoured Honey is now imported from California and Chili. The flavour depends largely upon the flowers from which it is derived; thus heather, linden and clover honey are prepared and sold in Canada. Dark coloured Honey, although often highly flavoured, as is the case with Jamaica Honey, obtains a lower price than paler and weaker-flavoured kinds. During dry summers bees often feed upon the honey-dew or aphis excrement on leaves, which gives it a dark colour; hence, perhaps, the popular prejudice against dark Honey. Pure Honey will always become more or less solid when kept and will contain numerous pollen grains, and by the character of the pollen grains present it is possible to guess at the country from which it was imported. Artificial Honey usually contains glucose prepared from Starch; in the United States 'corn syrup,' prepared from Maize Starch, is used, but such Honey usually contains traces of Sulphuric Acid and of Starch; hence the *P.B.* test for Sulphates and Starch. Australian Honey, derived largely from species of Eucalypti, has frequently a flavour objectionable to Europeans; Trebizonde Honey, and sometimes North American Honey, has proved to be poisonous or intoxicating, due apparently to the presence of Andromedotoxin derived from flowers of *Rhododendron* and *Azalea*, but these kinds of Honey are rarely met with in English commerce. The term "Virgin" Honey is applied to Honey of light colour produced by a new swarm, or to clear Honey that first runs from the comb of older hives.

Clarified Honey is alone official in the *B.P.*, and is directed to be prepared by straining Honey melted in a water-bath through flannel previously moistened with warm Water. In the *U.S.P.* 2 p.c. of paper pulp in shreds is directed to be boiled with the Honey and the scum which rises removed, the loss incurred being made up with Distilled Water and 5 p.c. Glycerin by weight added after straining. No sp. gr. is mentioned, but Vogl states that pure Honey should have a sp. gr. of 1·410 to 1·445.

The directions for clarification are very necessary for Honey derived from ordinary bee-hives, which may contain debris of immature insects and other impurities, but the Honey derived from frame hives is usually clean and pure, except for pollen derived from bee-bread, which is deposited in some of the cells.

Tests.—Clarified Honey is officially required to yield no characteristic reaction for Starch when tested by the Iodine Solution test; the *U.S.P.* directs 1 part of Honey to be boiled with 5 of Water, cools the resulting solution and adds Iodine Test-solution, when no blue or green coloration should be yielded; the *P.G.* does not include a test for Starch. It should be free from more than traces of Sulphates as ascertained by dissolving the ash (left on ignition) in Water, acidifying with Nitric Acid and adding Barium Chloride Solution. The *U.S.P.* and *P.G.* test for Sulphates as well as Chlorides in the Clarified Honey diluted with Water. The ash should not exceed 0·25 p.c.; the *U.S.P.* ash limit is 0·3 p.c.; the *P.G.* 0·4 p.c. The *U.S.P.* requires that unclarified Honey, when diluted with twice its weight of Water, should yield a liquid having a sp. gr. not lower than 1·099, presumably at 25° C. (77° F.), though in this instance the *U.S.P.* does not state so; the *P.G.* gravity for a similarly-prepared liquid is at least 1·111. Clarified Honey is almost invariably lævogyrate. It is slightly acid in reaction towards blue Litmus paper. The *P.G.* requires that it shall contain not more than 0·18 p.c. w/w of Formic Acid as ascertained by titration with Normal Volumetric Potassium Hydroxide Solution. The *U.S.P.* requires that when 1 c.c. of Absolute Alcohol is carefully run on to the surface of 2 c.c. of a 25 p.c. aqueous filtered solution no permanent milky zone should be produced at the junction of the two liquids, indicating the absence of Starch Sugar. The *P.G.* states that Clarified Honey shall not be rendered turbid by the addition of 2 parts by weight of Alcohol (90 p.c.), nor should any alteration in colour be manifest when mixed with 1 part by weight of Ammonia Solution. The *U.S.P.* includes a test for Cane Sugar with Sulphuric Acid, requiring that when 0·5 c.c. of a 25 p.c. aqueous solution is floated carefully on the surface of 2 c.c. of Sulphuric Acid no coloured line should be immediately produced at the point of contact, the coloration at the end of one hour should amount at most to a yellowish-brown, but no brown or nearly black colour should be developed.

Preparation.

OXYMEL. Oxymel.

Clarified Honey, liquefied (by weight), 40; Acetic Acid, 5; Distilled Water, *q.s.* to yield a product of the sp. gr. 1·320.

Dose.—1 to 2 fl. drm. = 3·6 to 7·1 c.c.

Foreign Pharmacopœias.—Official in Austr., Clarified Honey, 99, Acetic Acid (96 p.c.), 1; Dutch, Honey, 19, Acetic Acid (30 p.c.), 1; Hung., Honey, 50, Acetic Acid (96 p.c.), 1; Jap., Refined Honey, 8, Acetic Acid, 1, Distilled Water, 1; Port., Honey, 197, Acetic Acid (98 p.c.), 3; Russ., Honey, 49, Acetic Acid (95 p.c.), 1; Span., Clarified Honey, 2, White Vinegar, 7, evaporate to 2; Mex., Honey, 100, Acetic Acid, 6. Not in the others.

Not Official.

AQUA MELLIS.—Oil of Bergamot, 2 fl. oz.; Oil of Lavender, 4 fl. drm.; Oil of Cloves, 4 fl. drm.; Oil of Sandal Wood, 1 fl. drm.; Musk, 10 grains; Tincture of Saffron, 1 fl. oz. (or q. s.); Rose Water, 2 pints; Orange Flower Water, 2 pints; Honey, 1 oz.; Rectified Spirit, 8 pints.—*Gray's Supplement.*

Oil of Bergamot, 0·75; Oil of Lavender, 0·25; Oil of Cloves, 0·25; Oil of Sandal Wood, 0·05; Tincture of Musk, 1·50; Tincture of Saffron, 0·75; Rose Water (undiluted), 16; Orange Flower Water (undiluted), 16; Honey, 0·50; Alcohol q.s. to produce 100.—*B.P.C.*

MENTHÆ PIPERITÆ OLEUM.

OIL OF PEPPERMINT.

FR., ESSENCE DE MENTHE POIVRÉE; GER., PFEFFERMINZÖL;
ITAL., ESSENZA DI MENTA; SPAN., ESENCIA DE MENTA PIPERITA.

A volatile oil distilled from fresh flowering Peppermint, *Mentha piperita*, Sm.

A clear, colourless, pale yellow or greenish-yellow, oily liquid, possessing a peculiar refreshing odour and a characteristic taste, subsequently producing a sensation of coldness in the mouth. The principal constituent of the Oil is Menthol.

The Oil official in the *U.S.P.* is required to contain not less than 6 p.c. of Ester calculated as Menthyl Acetate and not less than 50 p.c. of total Menthol, representing that both free and combined as Ester.

It should be kept in well-closed glass bottles of a dark amber tint in a cool atmosphere and protected as far as possible from the light.

The variations in quality of the English oils depend (1) upon whether they have been obtained from 'Black Mint' (the ordinary plant) or from 'White Mint'; (2) upon the subsequent rectification; so that from the finest double-rectified White Mint to the first crude distillate from the Black Mint there are all manner of gradations, each of them sold as 'Ol. Menth. Pip. Ang.'

Dementholised Oil of Peppermint is commonly known as 'Menthene,' and is used for purposes of adulteration. A pure Peppermint Oil, cooled in a mixture of Ice and Salt, should, on the addition of one or two Menthol crystals, set to a more or less solid crystalline mass.

American Oil of Peppermint is also the product of *Mentha piperita*, but contains less Menthol.

Japanese Oil of Peppermint is obtained from *Mentha arvensis* var. *piperascens*, and is rich in Menthol.

Solubility.—In all proportions of Absolute Alcohol; 2 in 1 (*or less*) of Alcohol (90 p.c.), becomes turbid on adding more Alcohol.

Medicinal Properties.—An aromatic stomachic and carminative; antiseptic. Allays nausea, relieves spasmodic pains in the stomach. Useful in the flatulent colic of children. Covers the taste of nauseous medicines, such as Rhubarb, and mitigates the griping effect of purgatives. Externally applied it acts as a local anæsthetic and relieves neuralgic pain; *see* also Menthol.

Dose.—½ to 3 minims = 0·03 to 0·18 c.c.

Prescribing Notes.—*The Oil is taken on* **sugar,** *or in* **pill.** *See* p. 897.

Official Preparations.—Aqua Menthæ Piperitæ and Spiritus Menthæ Piperitæ. Contained in Pilula Rhei Composita and Tinctura Chloroformi et Morphinæ Composita.

Not Official.—Essentia Menthæ Piperitæ, Syrupus Menthæ Piperitæ.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital. (Essenza di Menta), Jap. (Oleum Menthæ), Mex. (Aceite Volatil de Menta Piperita), Norw., Port. (Essencia de Hortela Pimenta), Russ., Span., Swed., Swiss, and U.S.
The **herb** is Official in Dan., Fr., Ital., Norw., Swed., and U.S.

Tests.—Peppermint Oil has a sp. gr. of 0·900 to 0·920, the official figures are 0·900 to 0·910; the *P.G.* says 0·900 to 0·910, the *U.S.P.* 0·894 to 0·914 at 25° C. (77° F.). It is lævogyrate, the optical rotation being from −20° to −33° in a 100 mm. tube. No figures for optical rotation are given in the *B.P.* It is officially required to dissolve in four times its volume of Alcohol (70 p.c.). The *U.S.P.* adds "the solution showing not more than a slight opalescence." The *U.S.P.* requires it to also form with an equal volume of Alcohol (94·9 p.c.) a clear solution neutral in reaction towards Litmus paper. The *B.P.* requires that when a portion of the Oil is cooled to −8·3° C. (17° F.) and a few crystals of Menthol are added, a considerable separation of Menthol should take place. This test has been adversely criticised and its deletion from the Pharmacopœia has been recommended. The *B.P.* does not require a definite yield of Menthol nor suggest a method of determination. It has been recommended that the Menthol, both free and combined, should be determined by the usual methods.

The *U.S.P.* requires that the Oil shall contain not less than 6 p.c. of Ester calculated as Menthyl Acetate, and not less than 50 p.c. of total Menthol (both free and combined as Ester), as determined by weighing 10 c.c. of the oil in a flask and saponifying it by boiling under a reflux condenser with 25 c.c. of Semi-normal Volumetric Potassium Hydroxide Solution, and titrating the excess of Volumetric Hydroxide Solution, with Semi-normal Volumetric Sulphuric Acid Solution, using Phenolphthalein Solution as an indicator of neutrality. The number of c.c. of Semi-normal Sulphuric Acid Solution required, subtracted from the 25 c.c. of Semi-normal Potassium Hydroxide Solution used and the difference first multiplied by 9·834 and then divided by the weight of the Oil yields the percentage w/w of Menthyl Acetate present in the sample. The Oil remaining after saponification is then washed repeatedly with Water and transferred to an acetylisation flask, and the Menthol converted into an Acetyl derivative by boiling for one hour with 10 c.c. of Acetic Acid Anhydride and about 1 gramme of anhydrous Sodium Acetate. It is allowed to cool, freed from excess of Acid by washing first with Water and then with Sodium Hydroxide T.S. until the mixture is slightly alkaline in reaction towards Phenolphthalein Solution and dried by fused Calcium Chloride.

A measured quantity of 5 c.c. of the acetylised product is transferred to a flask and its weight accurately recorded. It is then saponified for one hour under a reflux condenser, with 50 c.c. of Semi-normal Volumetric Alcoholic Potassium Hydroxide Solution, the excess of Volumetric Alkali being titrated with Semi-normal Volumetric Sulphuric Acid Solution, Phenolphthalein Solution being employed as an indicator of neutrality. The number of c.c. of Volumetric Acid Solution required is subtracted from 50, the difference is multiplied by 7·749 and the product divided by the weight of acetylised product employed for the determination less the difference (between the number of c.c. of Semi-normal Volumetric Alcoholic Potassium Hydroxide Solution employed for the determination and the number of c.c. of Semi-normal Volumetric Sulphuric Acid Solution required to neutralise the excess of Volumetric Alkali Solution multiplied by 0·021), the quotient will represent the percentage of Menthol present in the Oil of Peppermint. The percentage of combined Menthol varies from 3 to 14 p.c. and the total Menthol from 30 to 70 p.c. In addition to a determination of the combined and total Menthol, a determination of the amount of Menthone is often useful. It may be carried out on a separate portion of the saponified Oil by diluting it with twice its volume of Alcohol and boiling it with metallic Sodium. The Menthone is reduced to Menthol, and the amount of Menthol produced may be determined by acetylisation.

The Oil of Mentha piperita is, as a rule, distinguished from that of Mentha arvensis by developing a blue colour or red fluorescence when mixed with 4 volumes of Glacial Acetic Acid ; this colour is not developed if air be excluded, and, depending as it does upon some minor constituent destroyed by prolonged exposure to sunlight, it may not be given by some old samples. Two varieties of the Oil, black and white Peppermint respectively, are grown in and about Mitcham. It is stated (*P.J.* '96, i. 125) that the white Oil of Peppermint may be distinguished from the black by its having greater optical activity, and not depositing Menthol at a low temperature, and containing a greater proportion of Esters of Menthol, and in giving an intense blue coloration, with red fluorescence, with Glacial Acetic Acid.

The more generally occurring sophistications of the Oil are abstraction of Menthol, adulteration with Turpentine Oil, Cedar Wood Oil, and the addition of other compound esters. The presence of dementholated Oil is indicated by the decrease in the sp. gr. and optical rotation and by the diminution in the total Menthol content. Turpentine Oil may be detected by its effect on the optical rotation, and by the optical rotation of the various fractions obtained on distilling the Oil. It may also be detected by its effect on the solubility of the Oil in Alcohol (70 p.c.). The figures given by Parry and Bennett in an examination of some Peppermint Oils (*C.D.* '04, i. 854) clearly point to adulteration of the Oil with a substance having the nature of a sesquiterpene, which led them to the opinion that the adulterant was Cedar Wood Oil. The Oils were insoluble in

Alcohol (70 p.c.), and the later fractions of the various distillates, in addition to being much less soluble than the distillate from pure Peppermint Oil, had in some cases a distinct taste of Cedar Wood Oil.

The presence of Acetin, a Glycerin Acetic ester, has been detected as an adulterant by Bennett (*C.D.* '03, i. 591). Oils containing the adulterant are distinguished by a higher sp. gr., the decrease in the optical rotation, the insolubility in Alcohol (70 p.c.), and the exceptional high ester figure obtained in the determination of the combined Menthol. A comparison of the distillates obtained on fractionating the Oil also readily reveals the presence of the adulterant. The production of the odour of Ethyl Acetate in the cold on the addition of Potassium Hydroxide is suggested as a characteristic, but hardly conclusive, test. Parry and Bennett (*C.D.* '03, ii. 154) have detected the presence of African Copaiba Oil in some adulterated samples of Peppermint Oil, by the isolation of a fraction of high boiling-point, which contained a body having a sp. gr. within the limits of Peppermint Oil, but with a strongly positive optical rotation and a high refractive index, which, from its physical characters and chemical reactions, was a substance belonging to the sesquiterpene series. Messrs. Schimmel and Co. have not met with Oils containing this adulteration. The Oil consists principally of Menthol, together with Acetic and Valerianic Acid esters of Menthol, Menthone, 2 lævogyrate terpenes, a dextrogyrate sesquiterpene and Phellandrene.

Alcohol.—It should be soluble in 4 volumes of Alcohol (70 p.c.), *B.P.* and *U.S.P.*; in 4 to 5 parts by weight of Alcohol (68 to 69 p.c.), *P.G.* The solution should not show more than a slight opalescence, *U.S.P.*

Optical Rotation.—It is lævogyrate, the angle of rotation varying from − 25° to − 33° in a 100 mm. tube at 25° C. (77° F.), *U.S.P.*

Mercuric Chloride.—If from 25 c.c. of the Oil the 1st 1 c.c. of distillate be collected and poured on an aqueous Mercuric Chloride Solution, a white film should not form at the zone of contact after a short time (absence of Dimethyl sulphide found in non-rectified oils), *U.S.P.*

Preparations.

AQUA MENTHÆ PIPERITÆ. PEPPERMINT WATER.
Oil of Peppermint, 77 minims; Water, 1½ galls.; distil ⅔.
(Oil about 1 in 1000)

Dose.—1 to 2 fl. oz. = 28·4 to 56·8 c.c.

Foreign Pharmacopœias.—Official in Belg., Spirit of Peppermint, 30 in 1000; Dan. and Russ., 1 of Oil in 2000; U.S., 1 of Oil in 500; Austr. and Hung., 1 of fresh leaves to produce 5 of distillate; Dutch, Ger., Swed. and Swiss, 1 to produce 10; Fr., Port. and Span., 1 to produce 1; Ital, 1 to produce 2; Jap., 1 to produce 30; Mex., 1 of fresh plant to produce 4.

SPIRITUS MENTHÆ PIPERITÆ. SPIRIT OF PEPPERMINT.
Oil of Peppermint, 1; Alcohol (90 p.c.), *q.s.* to yield 10.

B.P. '85 was 1 in 50.

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

Foreign Pharmacopœias.- Official in Austr.; Oil, 1, Alcohol (90 p.c), 10; Belg. (Spiritus Menthæ), Oil, 1, Alcohol, 99; Fr. (Teinture d'Essence de Menthe), Oil, 2, Alcohol, 98; Ger. and Jap. (Spiritus

Menthæ), 1 in 10; Swiss, 3 Oil in 100; U.S., from the **leaves** and **oil**, about 1 in 10; Mex. (Alcoholatura de Menta), 1 of fresh plant macerated in 3 of Alcohol (80 p.c.) for 8 days; Span. (Alcohol de Menta Piperita), 10 of the fresh leaves and tops macerated in 20 of Alcohol (60 p.c.) for 2 days; distil 10. Not in the others.

Not Official.

ESSENTIA MENTHÆ PIPERITÆ.—Oil of Peppermint, 1; Rectified Spirit, 4.—*B.P.* 1885, omitted in *B.P.* 1898, but now incorporated in the *B.P.C.*

SYRUPUS MENTHÆ PIPERITÆ.—Spirit of Peppermint, 1; Simple Syrup, *q.s.* to yield 8.

A good flavouring for nauseous medicines.

Foreign Pharmacopœias.—Official in Austr., Peppermint Water, 2, Sugar, 3; Belg., Spirit of Peppermint, 3, Syrup, 97; Ger. and Jap., Peppermint Leaves, 2, Alcohol, 1, Distilled Water, 10; macerate for 24 hours, press, filter, and in 7 of the filtrate dissolve 13 of Sugar to make 20 of Syrup by weight.

MENTHÆ VIRIDIS OLEUM.

OIL OF SPEARMINT.

N.O.Syn.—MENTHÆ CRISPÆ OLEUM.

FR., HUILE VOLATILE DE MENTHE VERTE; GER., RÖMISCHMINZÖL;
ITAL., ESSENZA DI MENTA; SPAN., ESENCIA DE MENTA.

A colourless, pale-yellow, or greenish-yellow, limpid liquid, having a characteristic odour and taste, distilled from fresh flowering Spearmint, *Mentha viridis*, L.

The principal constituent of the oil is Carvone, it also contains Linalool, lævo-limonene and possibly lævo-pinene. It is liable to become darker in colour with age and exposure to light and air, and should therefore be kept in well-stoppered glass bottles of a dark amber tint in a cool atmosphere and protected as much as possible from the light and from contact with the air.

Solubility.—In all proportions of Absolute Alcohol; 1 in 1 (*or less*) of Alcohol (90 p.c.), becomes milky on adding more Alcohol.

Medicinal Properties.—Similar to those of Oleum Menthæ Piperitæ.

Dose.—½ to 3 minims = 0·03 to 0·18 c.c.

Prescribing Notes. *The* **oil** *is given on* **sugar,** *or made into* **pills** *with Liquorice Powder and Soap. See p.* 897.

Official Preparation.—Aqua Menthæ Viridis.

Not Official.—Spiritus Menthæ Viridis.

Foreign Pharmacopœias.—Official in Hung., Port. (Essencia de Hortela), Russ. and U.S. (sp. gr. 0·914 to 0·934 at 25° C. (77° F.)). Not in the others.

Tests.—It is officially required to have a sp. gr. of 0·920 to 0·940; the *U.S.P.* says 0·914 to 0·934 at 25° C. (77° F.). It is lævogyrate, possessing an optical rotation from 35° to 48° in a tube of 100 mm., it should form a clear solution when mixed with an equal volume of a mixture of equal parts of Absolute Alcohol and Alcohol (90 p.c.). The *U.S.P.* states that it should form a clear solution when mixed with an equal volume of Alcohol (80 p.c.), the solution becoming turbid upon further dilution. The Oil is not official in the German Pharmacopœia.

AQUA MENTHÆ VIRIDIS. Spearmint Water.
Oil of Spearmint, 77 minims ; Water, 1½ galls. ; distil ⅔.
(Oil about 1 in 1000)

Dose.—1 to 2 fl. oz. = 28·4 to 56·8 c.c.

Official in U.S., 1 in 500 ; Port. (Agua de Hortela).

Not Official.

SPIRITUS MENTHÆ VIRIDIS.—Spearmint, 1 ; Oil of Spearmint, 10 ; Alcohol (95 p.c.), to yield 100 ; macerate for 24 hours and filter.—*U.S.P.*

Oil of Spearmint, 1 ; Alcohol (90 p.c.), to make 10.—*B.P.C.*

MENTHOL.

MENTHOL.

$C_{10}H_{20}O$, eq. 154·98.

Fr., Menthol ; Ger., Menthol ; Ital., Mentolo ; Span., Mentol.

Large, colourless, acicular, or prismatic crystals, obtained from the Volatile Oil distilled from the fresh Herb of *Mentha arvensis*, L., vars. *piperascens et glabrata*, Holmes, and of *Mentha piperita*, Sm.

It possesses the strong characteristic odour and taste of Peppermint, subsequently producing a sensation of warmth on the tongue, and upon inspiration of air a sensation of coldness.

It should be kept in well-stoppered glass bottles in a cool atmosphere.

Solubility.—Almost insoluble in Water and Glycerin ; soluble 5 in 1 of Alcohol (90 p.c.) ; 4 in 1 (nearly) of Chloroform ; 8 in 3 of Ether ; 10 in 7 of Petroleum Spirit ; 1 in 4 of Olive Oil.

Menthol forms a liquid when rubbed with equal parts of either Carbolic Acid, Chloral Hydrate, or Thymol ; 3 of Menthol and 2 Camphor form a liquid at ordinary temperatures, but when in equal parts is liquid only whilst warmed.

Medicinal Properties.—Antiseptic, stimulant, carminative, local anæsthetic. Applied externally as a local analgesic in some forms of neuralgia and headache, also in rheumatism, in pruritus and in pleurodynia and toothache.

Used as a **snuff**, along with Boric Acid 2 parts, and Ammonium Chloride 3 parts ; also dissolved in oil as a spray for influenza, hay-fever, coryza and ozœna.

Menthol and Eucalyptus Oil dissolved in Alcohol (90 p.c.) is used with an oro-nasal inhaler for cold in the head,

10 minims of a 20 p.c. alcohol solution of Menthol used for an hour or so on the sponge of an inhaler is useful in the troublesome cough of phthisis.—*Edin. Med. Jour.* '05, 465.

A 20 p.c. solution in Olive Oil (with 3 p.c. Guaiacol) as an intralaryngeal injection (20 to 30 minims) in phthisis and bronchiectasis.—*Pr.* liii. 276.

Intralaryngeal injection of a 10 p.c. solution in Olive Oil, along with Boric Acid and Quinine Sulphate internally in gangrene of the lung.—*B.M.J.* '99, i. 71.

A good remedy in painful enteritis with mucous diarrhœa. *M.A.* '95, 239; and in gastralgia and vomiting.—*B.M.J.E.* '07, i. 36; *Pr.* '07, i. 717.

Spray containing 5 to 20 p.c. of Menthol recommended in tubercular laryngitis.—*T.G.* '87, 762.

Menthol and Iodoform equal parts as a **surgical dressing.**—*B.M.J.* '88, i. 933.

Dose.—$\frac{1}{2}$ to 2 grains = 0·032 to 0·13 gramme.

Prescribing Notes.—*It is best made into* **pills** *by the addition of Soap and Dispensing Syrup. Usually employed externally. Largely used in the form of* **cones** *and* **pencils**; *also by* **insufflation,** *or as an* **ointment, pigment** *or* **plaster.**

Pastilles may be obtained containing Menthol $\frac{1}{20}$ or $\frac{1}{10}$ grain in each; also Menthol and Cocaine $\frac{1}{20}$ grain of each; Menthol $\frac{1}{20}$, Extract of Rhatany, 2 grains; Menthol, $\frac{1}{20}$ grain, and Bromide of Ammonium, 1 grain; Menthol, $\frac{1}{20}$ grain, and Codeia, $\frac{1}{8}$ grain; Menthol, $\frac{1}{10}$ grain, and Caffein, $\frac{1}{2}$ grain; Menthol, $\frac{1}{20}$, Cocaine, $\frac{1}{20}$ grain, and Red Gum, 2 grains; Menthol, $\frac{1}{20}$ grain, Eucalyptus, 1 minim, and Cocaine, $\frac{1}{20}$ grain; Menthol, $\frac{1}{20}$, and Heroin, $\frac{1}{20}$ grain: Menthol, $\frac{1}{20}$, and Terpine, $\frac{1}{2}$ grain. **Tablets** containing $\frac{1}{10}$, $\frac{1}{20}$, $\frac{1}{5}$, $\frac{1}{4}$, $\frac{1}{2}$ grain, also in combination with other drugs.

Official Preparation.—Emplastrum Menthol.

Not Official.—Applicatio Menthol, Aqua Menthol, Gossypium Menthol, Insufflatio Menthol, Insufflatio Menthol Composita, Nebula Menthol, Nebula Menthol Composita, Nebula Menthol cum Cocaina, Linimentum Menthol, Pastillus Menthol, Pigmentum Menthol, Pigmentum Mentholis Compositum, Mentholeate, Vasolimentum Mentholi, Parogenum Mentholis, Poudre Contre le Coryza, Unguentum Menthol, Menthol Valerianate, Validol, Menthosol and Menthoxol.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Jap., Norw., Russ., Swed., Span. and Swiss (Mentholum), Ital. (Mentolo), Mex. (Mentol), U.S. (Menthol). Not in the others.

Tests.—Menthol when pure has a m.p. from 43·5° to 44·5° C. (110·3° to 112·1° F.), the *B.P.* gives the m.p. as 42° C. (107·6° F.) and that it should not exceed 43° C. (109·4° F.).

Tyrer has shown that commercial Menthol melts at 39·02° C. (102·23° F.), dried Menthol at 41·57° C. (106·82° F.) and purified Menthol 42·78° C. (109° F.), and is of opinion (*Y.B.P.* '00, 453) that only dried and purified Menthol agrees with the Pharmacopœia requirements; the *U.S.P.* and the *P.G.* both give 43° C. (109·4° F.). It boils at about 217° C. (422·6° F.) when the mercury thread of the thermometer is immersed entirely in the vapour; the *B.P.* does not refer to the boiling point; both *U.S.P.* and *P.G.* give 212° C. (413·6° F.). It dissolves readily in Alcohol, forming a clear solution which should be neutral in reaction towards Litmus paper, and which is lævogyrate. It volatilises at ordinary temperatures and rapidly on heating; the Pharmacopœia states that when boiled with Sulphuric Acid diluted with half its volume of Water it acquires an indigo blue or ultramarine colour, the acid becoming brown; this colour reaction is considered (*Y.B.P.* '00, 338) of extremely doubtful value.

The *P.G.* states that it yields with 40 parts (by weight) of Sulphuric Acid a brownish-red, turbid fluid which clears in the course of a day, and shows on its surface a colourless layer which no longer possesses an odour of Menthol. No method of determination is given in either of the three Pharmacopœias, but it may be determined as described under Oleum Menthæ Piperitæ by acetylisation with Acetic Anhydride.

The more generally occurring impurities are Wax, Paraffin, or inorganic substances. All three substances may be immediately detected by any residue remaining after the volatilisation of the Menthol. The *U.S.P.* and the *P.G.* include a test for Thymol, requiring that no green coloration shall be produced when a few drops of Sulphuric Acid containing a drop of Nitric Acid are added to a solution of a few crystals of Menthol in Glacial Acetic Acid. The Pharmacopœia states that Menthol crystals are usually more or less moist from adhering oil, and Schimmel and Co. have pointed out in their *Semi-Annual Report* for October 1907 that by this statement the *B.P.* admits an adulterated article.

Heat.—It volatilises slowly at ordinary temperatures, *U.S.P.* It is completely volatilised when heated at the temperature of a water-bath, *B.P.* 0·1 gramme should not leave a weighable residue when so heated, *P.G.* Heated in an open dish it should volatilise without residue, *U.S.P.*

Sulphuric Acid.—If Menthol be boiled with a mixture of Sulphuric Acid 2 volumes and Water 1 volume, the Menthol becomes indigo blue or ultramarine in colour, and the Acid turns brown, *B.P.* It gives with 40 parts of Sulphuric Acid a brownish-red turbid liquid which clarifies in the course of a day, and on its surface shows a layer which does not smell of Menthol, *P.G.*

Sulphur, Nitric and Acetic Acids.—If Menthol be added to a mixture of Acetic Acid 1 c.c., Sulphuric Acid 6 drops, and Nitric Acid 1 drop, no coloration should appear, *P.G.* 3 drops of Sulphuric Acid and 1 drop of Nitric Acid added to a solution of a few crystals of Menthol in 1 c.c. of Glacial Acetic Acid should produce no green colour, *U.S.P.*

Preparation.

EMPLASTRUM MENTHOL. MENTHOL PLASTER.

Menthol, 1½; Yellow Beeswax, 1; Resin, 7½. Mix in the Menthol when the melted Resin and Beeswax have cooled to 160° or 170° F. (71·1° or 76·7° C.).

The quantity of Menthol is reduced and that of the Resin slightly increased to that of *B.P.* 1885.

Not Official.

APPLICATIO MENTHOL.—Menthol, 2; Chloroform, 8; Pure Ether (sp. gr. 0·720), 8; Eau de Cologne, 4. A good external application for neuralgia.

AQUA MENTHOL.—Menthol, 8 grains; Alcohol (90 p.c.), 2 fl. drm.; Distilled Water, 20 fl. oz.—*Bournemouth Formulary.*

Menthol, 0·10; Alcohol, 0·15; Distilled Water, 100.—*B.P.C.*

GOSSYPIUM MENTHOL.—Menthol, 7 grains; White Adepsine Oil, 3 minims; Pure Ether, 6 fl. drm.; Cotton-Wool, in a thin sheet, 60 grains.

INSUFFLATIO MENTHOL (Nasal).—Menthol, in powder, 5 grains; Bismuth Oxychloride, ½ oz.; Dried Starch, in fine powder, to 1 oz.

INSUFFLATIO MENTHOL COMPOSITA.—Menthol, 2 drm.; Ammonium Chloride, 3 drm.; Boric Acid, to 1 oz.—*Central Throat.*

Pulvis Menthol Compositus.—Menthol, 2; Boric Acid, in powder, 3; Ammonium Chloride, in powder, 3.—*St. Thomas's.*

For insufflation.

Insufflatio Mentholis.—Menthol, in powder, 5; Ammonium Chloride, in fine powder, 45; Boric Acid, in powder, 50.—*B.P.C.*

Insufflatio Menthol. *Syn.* Menthol Snuff.—Menthol, 1; Ammonium Chloride, 3; Boric Acid, 2; Lycopodium, 6.—*Martindale.*

Pulvis Mentholis Compositus. *Syn.* Compound Menthol Snuff.—Menthol, 5; Ammonium Chloride, 10; Boric Acid, 20; Lycopodium, 65.—*B.P.C.*

Insufflatio Menthol Composita.—Ammonium Chloride, 10; Camphor, 4; Cocaine Hydrochloride, ⅛; Lycopodium, 35; Menthol, 2; Oxychloride of Bismuth, 10; Starch, in fine powder, *q.s.* to 100.—*Throat.*

Insufflatio Mentholis et Cocainæ. Menthol, 2·50; Cocaine Hydrochloride, 0·15; Ammonium Chloride, 25; Camphor, 5; Lycopodium, *q.s.* to produce 100.—*B.P.C.*

NEBULA MENTHOL.—Menthol, 4; Paraffinum Liquidum, 100.—*Charing Cross.*

Menthol, 5; Liquid Paraffin, *q.s.* to produce 100.—*B.P.C.*

NEBULA MENTHOLIS COMPOSITA.—Menthol, 30 grains; Cocaine Hydrochloride, 5 grains; Compound Tincture of Benzoin, 1 fl. oz.; Glycerin, to 2 fl. oz.—*A.Ph.F.*

Menthol, 3; Cocaine Hydrochloride, 0·50; Simple Tincture of Benzoin, 50; Glycerin, *q.s.* to produce 100.—*B.P.C.*

NEBULA MENTHOL CUM COCAINA.—Menthol, 10 grains; Cocaine, 5 grains; Oleic Acid, 15 minims; Liquid Paraffin, to 1 fl. oz.—*Throat.*

Menthol, 5; Cocaine, 2; Almond Oil, 25; Liquid Paraffin, *q.s.* to produce 100.—*B.P.C.*

LINIMENTUM MENTHOL.—Menthol, 3; Chloroform, 4; Olive Oil, *q.s.* to produce 16; is useful in lumbago, neuralgia, sciatica, and ringworm.—*Martindale.*

Menthol, 20; Chloroform, 25; Olive Oil, *q.s.* to produce 100.—*B.P.C.*

PASTILLUS MENTHOL.—Menthol, ⅙ grain; Glyco-gelatin, 20 grains.—*Throat.*

PIGMENTUM MENTHOLIS COMPOSITUM.—Menthol, 1 grain; Thymol, 1 grain; Oil of Eucalyptus, 1 drm.; Liquid Paraffin, *q.s.* to produce 1 oz.—*St. George's, 3rd edit.*

Menthol, 0·25; Thymol, 0·25; Oil of Eucalyptus, 12·50; Liquid Paraffin, *q.s.* to produce 100.—*B.P.C.*

PIGMENTUM MENTHOL.—Menthol, 1; Olive Oil, 4.—*Guy's.*

Menthol, 60 grains; Liquid Paraffin, to 1 oz.—*Throat.*

Mentholeate.—A name given to a solution of Menthol in Oleic Acid. Menthol, 200 grains, Oleic Acid, ½ fl. oz.; heat gently in a test-tube till dissolved. It is recommended as the best form for external application.

POUDRE CONTRE LE CORYZA (Fr.).—Beta-naphthol Salicylate, 30; Phenyl Salicylate, 15; Menthol, 4; Cocaine Hydrochloride, 0·5; Boric Acid, 50·5.

VASOLIMENTUM MENTHOLI.—Menthol, 2; Liquid Vasoliment, 98.—*Hager.*

Parogenum Mentholis. *Syn.* Menthol Vasoliment.—Menthol, 2; Parogen, *q.s.* to produce 100.—*B.P.C.*

UNGUENTUM MENTHOL.—Menthol, 5 grains; Vaseline, 1 oz.—*Throat.*

MENTHOL VALERIANATE.—A clear, colourless, oily liquid, having a faint odour of Menthol. It is a Menthol Ester of Valerianic Acid, insoluble in Water, soluble in Alcohol (90 p.c.) and in Ether. Useful as a stomachic and carminative in the anorexia and vomiting of phthisis, and in the vomiting of pregnancy. Also in hysteria and neuralgia.

Dose.—5 to 10 minims = 0·3 to 0·6 c.c. on Sugar.

Tests.—Menthol Valerianate, when warmed with Liquor Potassæ, is decomposed, yielding an odour of Menthol and Potassium Valerianate. If the alkaline aqueous liquid be rendered acid with Sulphuric Acid, the characteristic odour of Valerianic Acid is evolved.

Validol.—A solution of Menthol in Menthol Valerianate, containing about 30 p.c. of the former.

Efficacious in sea-sickness in doses of 8 to 20 drops.

Menthosol, a mixture of Menthol and Para-monochlorophenol, is applied in the form of 5, 10 or 15 p.c. solutions in laryngeal phthisis.—*B.M.J.E.* '02, i, 43.

Menthoxol is stated to be an alcoholic solution of Menthol, containing Hydrogen Peroxide. It has been used in the treatment of abscesses and suppurating wounds.

Not Official.

MENYANTHES.

BUCKBEAN.

The Leaves of *Menyanthes trifoliata*, L., a gentianaceous plant.

Medicinal Properties.—A bitter tonic and cathartic.
Recommended in functional amenorrhœa.—*L.* '85, i. 132, 235.

Dose.—2 to 6 fl. oz. = 56·8 to 170·4 c.c. of 1 in 20 Infusion.

Foreign Pharmacopœias.—Official in Austr., Dutch, Ger., Hung., Jap. and Swiss (Trifolium Fibrinum); Dan., Fr., Norw., Russ. and Swed. (Menyanthes); Ital. (Trifoglio Fibrino); Port. (Trifolio Fibrino). Not in the others.

EXTRACTUM MENYANTHIS.—Buckbean exhausted with boiling Water, and the liquor evaporated to an Extract.

Dose.—15 to 30 grains = 1 to 2 grammes.

Foreign Pharmacopœias.—Official in Austr., Dutch, Ger., Port., Russ. and Swed. Not in the others.

Not Official.

METHYL CHLORIDUM.

CH_3Cl, eq. 50·10.

Methyl Chloride is a colourless gas, of an ethereal odour and a sweet taste, soluble in Water to the extent of 2·8 volumes. It burns with a greenish flame. It is reduced to the liquid state by cold and pressure, and is supplied in metal or glass cylinders, some of which are fitted with a valve and a tube for producing a jet.

Medicinal Properties.—It is used as a local anæsthetic for surgical procedures of short duration, producing intense cold by its evaporation. It is allowed to escape from the tube, forming a spray which should be applied obliquely to the part, but only for a few seconds, as, if used incautiously, it may produce blisters.
Used in lumbago, sciatica and neuralgia by stypage, *i.e.*, laying on the painful part a pledget of Cotton-Wool or Lint soaked in the remedy; or the spray can be played on to the Wool as it lies on the part.

Official in Fr. (Chlorure de Méthyle).

Tests.—Methyl Chloride, when passed through Water which has been cooled down by Ice, yields a solution which should be neutral in reaction towards Litmus paper, should yield no turbidity or precipitate with Silver Nitrate Solution, and should not affect Starch Solution containing Potassium Iodide.

Not Official.

METHYLAL.

$C_3H_8O_2$, eq. 75·49.

A colourlesss, volatile liquid, sp. gr. 0·855. Boils at 107° F. Readily soluble in Water and Alcohol (90 p.c.).

Medicinal Properties.—Has been employed as a hypnotic; mixed with Oil or Glycerin, as a local anæsthetic.

Almost as ill adapted for a hypnotic as Ether. *L.* '99, ii. 5.

Dose.—15 to 60 minims (in Water) = 0·9 to 3·6 c.c.

Not Official.

METHYLENE BLUE.

$C_{16}H_{18}N_3SCl$, eq. 317·39.

TETRAMETHYLTHIONINE HYDROCHLORIDE, METHYLTHIONINÆ HYDROCHLORIDUM, METHYLTHIONINE HYDROCHLORIDE.

Prismatic crystals having a bronze-green fluorescence or as a dark green crystalline powder. It stains the skin an intense blue. It dissolves readily in Water, forming an intensely blue coloured solution.

It may be prepared by the action of Hydrogen Sulphide on an oxidation product of Para-amido-dimethylaniline.

Medicinal Properties.—It has been employed as an analgesic in rheumatism and sciatica, also in migraine; in some cases it may produce gastric irritation and cystitis.—*B.M.J.* '98, ii. 1055; *B.M.J.E.* '00, ii. 75. It acts specifically in malaria and also in gonorrhœa.—*B.M.J.E.* '01, i. 104; *T.G.* '00, 474.

Intramuscular injection for diagnosing the degree of penetrability of the kidney tissue. 1 c.c. of a 5 p.c. solution injected deeply into the gluteal muscles. Urine should be greenish in colour half an hour after injection. A more rapid appearance of the colour, or its shortened elimination and delayed excretion, serve as criteria for the degree of the renal lesion.—*T.G.* '00, 404; *Merck's Archives*, '99, 104.

Use in malaria further advocated (*Pr.* lxxviii. 682); 2-grain doses with powdered nutmeg and a small quantity of Codeine to prevent strangury and nausea.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

Prescribing Notes.—*It is conveniently given in pills, using 'Diluted Glucose' as the excipient, or in capsules. Care must be taken to ensure purity of the sample, and only Zinc-free Methylene Blue should be used for internal administration. Methylene Blue is frequently prescribed in capsules with Oil of Sandal Wood.*

Foreign Pharmacopœias.—Official in Fr. (Bleu de Méthylène officinale); Mex. (Azul de Metilena); Swiss (Methylenum cœruleum); U.S. (Methylthioninæ Hydrochloridum).

Tests.—Methylene Blue yields, when dissolved in Water, a very deep blue coloured solution, changing on the addition of Hydrochloric Acid to a lighter shade of blue, and on the addition of Sodium Hydroxide Solution to a purplish shade. When the latter reagent is added in excess a dirty violet precipitate is produced. When treated with Zinc and Hydrochloric Acid it is decolorised. The double Zinc Salt (Tetramethylthionine Zinc Hydrochloride) is also known commercially under the name of Methylene Blue, and it is necessary, therefore, to distinguish between this and Methylene Blue for medicinal use. Medicinal Methylene Blue should not leave more than 0·4 p.c. of ash, which, when dissolved in Hydrochloric Acid, should not answer the tests distinctive of Zinc given under that heading. It should not afford any reaction for Arsenic when ignited with dry Sodium Carbonate and Potassium Nitrate and examined by the modified Gutzeit's test.

Antirheumatin, a mixture of Sodium Salicylate and Methylene Blue, introduced as an antirheumatic, and administered internally in doses of 1 to 2 grains = 0·06 to 0·12 gramme. It must not be confounded with **Antirheumin,** which is a preparation containing Fluorine compounds.

METHYL VIOLET. Under the fancy name **Pyoctanin** (blue) it has been recommended in the internal and local treatment of malignant tumours. *T.G.* '94, 706; *B.M.J.E.* '94, ii. 12. Locally in corneal ulceration.—*T.G.* '93, 55.

MEZEREI CORTEX.

MEZEREON BARK.

FR., MÉZÉRÉON OU BOIS GENTIL; GER., SEIDELBASTRINDE; ITAL., MEZEREO; SPAN., MECEREON.

The dried Bark of *Daphne Mezereum*, L., of *Daphne Laureola*, L., or of *Daphne Gnidium*, L.

Medicinal Properties.—Externally, rubefacient and vesicant. Rarely given alone internally as a gastric stimulant, but it appears as an ingredient in Liquor Sarsæ Compositus Concentratus.

Official Preparation.—Used in the preparation of Liquor Sarsæ Compositus Concentratus.

Not Official.—Extractum Mezerei Æthereum and Unguentum Mezerei.

Foreign Pharmacopœias.—Official in Jap., Mex. (Mezereón), Port. (Trovisco), Swed., Swiss and U.S. Not in the others.

Descriptive Notes.—Mezereon Bark as met with in commerce consists of loose, more or less quilled, strips of thin bark about $\frac{1}{20}$ in. thick, finely fibrous, and too tough to be broken; the colour varies from pale, dull greenish-brown in that of *D. Laureola* to reddish-brown in that of *D. Mezereum* and dark purplish in that of *D. Gnidium*. Mezereon Bark is chiefly imported from Germany, but the last-named from Algeria and the South of France. In *D. Laureola* the leaf scars are crowded at intervals, but in the two latter are irregularly scattered, and the bark of *D. Gnidium* is hairy towards the apex. The outer corky coat readily separates from the green fibrous layer, which is white and satiny on the inner surface. The bark has an acrid taste and but little odour. It apparently owes its activity to a resin. The official bark is referred to the three species above named, but to *D. Mezereum* and other European species in the *U.S.P.* and the distinguishing feature is there mentioned that the transverse section exhibits numerous groups of bast fibres in the secondary bast. Mezereon Bark is not used in powder, but the principal microscopical features are the very long fibres, often 3 mm. long and only 5 to 10 μ in diameter; and the thin-walled tabular cells of the cork hexagonal in tangential section.

Tests.—Mezereon Bark contains from 3 to 4 p.c. of ash, which latter figure should not be exceeded.

Not Official.

EXTRACTUM MEZEREI ÆTHEREUM (*B.P.* '85).—The Ether-soluble portion of alcoholic extract of Mezereon Bark.

This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in Port. (Extracto de Trovisco) with Alcohol only; U.S., **Fluid Extract,** 1 in 1, Mezereon Bark treated with a mixture of Alcohol (90 p.c.), 4; Water, 1. Not in the others.

UNGUENTUM MEZEREI.—Ext. Garou, 4; Lard, 90; White Wax, 10; Alcohol, 9.

Not Official.

MORI SUCCUS.

MULBERRY JUICE.

The deep purple juice of the ripe Fruit of *Morus nigra*, L. Sp. gr. about 1·060.

Medicinal Properties.—Refrigerant and laxative; serves to prepare a grateful drink in febrile cases, and as a flavouring and colouring agent.

Foreign Pharmacopœias.—Official in Fr., Suc de Mûre; Mex., Jugo de Moras; Port., Amoras; Span., Zumo de Moras.
The **Fruit** is official in Ital.

SYRUPUS MORI.—Mulberry Juice, 20; Refined Sugar, 36; Alcohol (90 p.c.), 2½; heat the Juice to the boilingpoint, and, when it has cooled, filter it; dissolve the Sugar in the filtered liquid by a gentle heat, and add the Alcohol; the product should weigh 54. Sp. gr. 1·330.

Dose.—1 fl. drm. = 3·6 c.c.

Foreign Pharmacopœias.—Official in Austr., Belg., Fr. (Sirop de Mûres), Hung., Ital. and Swiss. Not in the others.

Not Official.

MORPHINA.

$C_{17}H_{19}NO_3, H_2O$, eq. 300·93.

Colourless, shining, rhombic prisms, or as a white, odourless, crystalline powder, having a bitter taste and an alkaline reaction. It is the principal alkaloid obtained from Opium.

Solubility.—1 in 1000 of cold Water; 1 in 100 of Alcohol (90 p.c.); 1 in 10 of Oleic Acid; 1 in 125 of Glycerin; but the solubilities depend very largely on the physical condition of the alkaloid. Insoluble in Ether (thus differing from Narcotine). Aqueous alkalis, even Lime Water, dissolve it readily when freshly precipitated; Ammonia, however, but sparingly; where a very strong solution is required, Hypophosphorous Acid has been suggested as a solvent.

Medicinal Properties (*see* Morphinæ Hydrochloridum).—Owing to its slight solubility in Water it is rarely given in its purely alkaloidal form.

Dose.—$\frac{1}{10}$ to ½ grain = 0·0067 to 0·032 gramme.

Official Preparations.—Morphine Acetate, Morphine Hydrochloride, and Morphine Tartrate.

Not Official.—Elixir Acetomorphinæ et Terpini, Elixir Heroin cum Terpene, Glycerinum Acetomorphinæ, Glycerinum Heroinæ Compositum, Linctus Acetomorphinæ, Linctus Heroin, Pastillus Acetomorphinæ Compositus, Pastilli Heroin, Diacetyl-morphine (Heroine), Diacetyl-Morphine Hydrochloride, Benzyl-morphine Hydrochloride (Peronine), Mono-ethyl-morphine Hydrochloride (Dionine), Morphine Hydrobromide, Morphine Lactate, and Morphine Sulphate, Liquor Morphinæ Sulphatis, Pulvis Morphinæ Compositus.

Foreign Pharmacopœias.—Official in Fr., Hung., Mex. (Morfina), Port., Span. and U.S. Not in the others.

Tests.—Morphine when heated to 100° C. (212° F.) loses its Water of crystallisation slowly, but when dried at 110° C. (230° F.) the Water of crystallisation is rapidly lost. It melts at about 230° C. (446° F.), and at a somewhat higher temperature the alkaloid turns brown. It is only very slightly soluble in

Water and the aqueous solution has an alkaline reaction towards red Litmus paper.

A particle of solid Morphine yields the following characteristic colour reactions: when treated with a drop of a perfectly neutral Ferric Chloride T.S., or with Ferric Ammonium Sulphate Solution (10 p.c. w/v), it yields a very characteristic deep greenish-blue colour, changing to green on adding an excess of the reagent; with Sulphuric Acid it yields no coloration, or at the most but a slight yellowish tint, but if heated on the water-bath it assumes a brownish coloration. Dott has pointed out that solid Morphine yields a distinct though faint pink colour when treated with Sulphuric Acid; if heated with Sulphuric Acid to 150° C. (302° F.) a dirty green or rose-red colour is produced, and if the temperature be still further raised the solution becomes almost black; when cooled and diluted with Water the solution yields a greenish-blue colour, which on the addition of Ammonia Solution changes to green; when heated on a water-bath for 10 or 15 minutes with Sulphuric Acid, cooled and a few drops of diluted Nitric Acid added, a violet coloration, changing rapidly to blood-red, is produced; Sulphuric Acid, to which a small quantity of Sodium Arsenate has been added, affords a bluish-green coloration, which on raising the temperature passes from green to deep blue and finally to a dark olive green; if a small quantity of Bismuth Oxynitrate be added to a mixture of Sulphuric Acid and the alkaloid, a purplish-brown coloration is yielded. Sulphuric Acid containing 0·5 p.c. of Ammonium Molybdate (Frohde's) reagent yields with Morphine a violet-blue coloration, changing to green and ultimately to deep blue. Sulphuric Acid containing a crystal of Potassium Iodate yields a dark brown coloration; Sulphuric Acid containing in each c.c. a drop of Formaldehyde Solution yields an intense purple coloration; a similar purple coloration is produced if the alkaloid be mixed with 2 parts of Cane Sugar, and if a drop of concentrated Sulphuric Acid be added, the colour changing gradually from blood-red to brownish-red and becoming brown on dilution with Water. Sulphuric Acid containing a crystal of Potassium Bichromate is slowly reduced with the production of a green coloration. Nitric Acid yields an orange-red colour changing to yellow. With Potassium Ferricyanide Solution containing a drop of neutral Ferric Chloride T.S. it yields a deep blue coloration. It reduces Iodic Acid with liberation of Iodine, and if solution of Starch be present a blue coloration of Iodide of Starch is immediately produced. In employing this test it is essential that the reagent itself should not give free Iodine on treatment with a drop of diluted Sulphuric or Acetic Acid. It dissolves readily in diluted Hydrochloric or Sulphuric Acid, and if the alkaloid be carefully and exactly neutralised and the solution be of a sufficient degree of concentration, it will respond to the following tests. Ammonia Solution produces a white precipitate soluble with difficulty in excess of the reagent; Ammonium Carbonate Solution and Solution of Lime Water also produce a white precipitate speedily becoming crystalline. The alkali Carbonates in excess have a tendency to redissolve the precipitate, but it is insoluble in excess of the Bicarbonates. Potassium or Sodium Hydroxide Solution yields a white precipitate readily soluble in excess. Mercuric Potassium Iodide (Mayer's) Solution produces a white gelatinous precipitate. Potassium Ferricyanide Solution containing 1 or 2 drops of Ferric Chloride T.S. produces in solutions faintly acidified with Hydrochloric Acid a blue coloration or a precipitate of Prussian blue. Morphine is alkaline in reaction towards red Litmus, Methyl Orange, and Iodeosin Solutions; it forms salts which are neutral in reaction towards these indicators. It may therefore be titrated with Normal or Tenth-normal Volumetric Hydrochloric or Sulphuric Acid Solution, using one or other of these solutions as an indicator of neutrality. Methyl Orange or Iodeosin Solution is most suitable for the purpose; a known weight of the alkaloid may be dissolved in an excess of Normal Volumetric Sulphuric Acid Solution, a few drops of Methyl Orange or Iodeosin Solution added and the excess of Acid titrated with Normal Volumetric Sodium Hydroxide Solution. The number of c.c. of volumetric alkali solution in excess is subtracted from the number of c.c. of volumetric acid solution used, the difference representing the number of c.c. of normal volumetric acid solution neutralised by the alkaloid. 1 c.c. of Normal Volumetric Sulphuric Acid Solution represents 0·30093 gramme of hydrated Morphine or 0·28305 gramme of anhydrous Morphine. Morphine may be distinguished from

Codeine by the Nitric Acid test, Codeine yielding a yellow coloration not changing to red; by Ferric Chloride T.S., which produces a dull greenish-blue coloration, but which does not affect Codeine; by Sulphuric Acid, containing a trace of Selenious Acid, which gives with Morphine a blue coloration changing to green and finally to brown, and with Codeine a green coloration changing to blue and afterwards to a grass green; this test also serves to distinguish Morphine from Narcotine, the latter giving a green coloration changing to brown and ultimately to cherry-red. Morphine may be distinguished from Quinine by the Nitric Acid colour test; from Strychnine and Acetanilide by the Sulphuric Acid and Potassium Bichromate test, the former yielding with these reagents a purple coloration, the latter a deep crimson colour.

The more generally occurring impurities are other alkaloids, *e.g.*, Narceine, Narcotine, Thebaine, and Pseudomorphine, Ammonium salts, Meconic Acid or Meconates, and mineral matter.

The Morphine obtained from any of the official Morphine salts by precipitation is required by the *B.P.* to yield little or nothing to Benzol, which is considered sufficient evidence of the absence of other alkaloids; the *U.S.P.* requires that 0·2 of a gramme of Morphine should yield a clear solution with 4 c.c. of Potassium Hydroxide T.S., and that no insoluble residue should remain; the Solution of Potassium Hydroxide should not evolve any odour of Ammonia, indicating the absence of Ammonium salts. If a few drops of Ferric Chloride T.S. be added to a solution of 0·1 of a gramme of Morphine in 10 c.c. of diluted Hydrochloric Acid no red coloration should be produced, indicating the absence of Meconic Acid or Meconates. When ignited with free access of air, Morphine should leave no weighable residue, indicating the absence of mineral matter.

A reference to a process of separating small quantities of Morphine from Tinctures and such like substances is indicated in the large type under Tinctura Camphoræ Compositus, a reference is also made under the same heading to the association, in cough mixtures, of Morphine with the alkaloids of Ipecacuanha; the latter yield somewhat similar colour reactions to those of Morphine, and a further reference is made to these reactions under Emetine, Cephaëline, and Psychotrine.

DIACETYL-MORPHINE. Heroin, $C_{17}H_{17}NO\ (C_2H_3O_2)_2$, eq. 366·45.—A fine white, odourless, crystalline powder, possessing a feeble bitter taste. **Soluble** 1 in 900 of Water; 1 in 40 of Alcohol (90 p.c.); readily in diluted acids.

Official in Austr. (Morphinum diacetylicum), and (Russ. Heroinum).

Tests. The Acetic Ester of Morphine melts at 169° to 172° C. (336·2° to 341·6° F.). It is readily and completely soluble in Chloroform, but practically insoluble in Water. It may be distinguished from Morphine by yielding no blue coloration when mixed with a few drops of a solution of Potassium Ferricyanide containing a little Ferric Chloride T.S., and by its failure to set free Iodine from Iodic Acid; with Sulphuric Acid containing a trace of Nitric Acid it yields a yellowish-red coloration in the cold, and, on warming, a blood-red coloration; with Nitric Acid it yields at first a yellow coloration, and, on warming, a red. When warmed with Sulphuric Acid and a few c.c. of Alcohol (90 p.c.) it evolves a characteristic odour of Ethyl Acetate. It is alkaline in reaction towards the usual indicators of neutrality, and combines with diluted mineral acids to form salts which are neutral in reaction towards the usual indicators. It may be determined by direct titration with Normal Volumetric Sulphuric Acid Solution, using Methyl Orange or Iodeosin Solution as an indicator of neutrality. 1 c.c. of Normal Volumetric Sulphuric Acid Solution represents 0·36645 gramme of Diacetyl-morphine. It should dissolve in concentrated Sulphuric Acid without colour, indicating the absence of foreign organic impurities; the presence of Morphine may be ascertained by the reactions given above. When ignited with free access of air it should leave no weighable residue.

DIACETYL-MORPHINE HYDROCHLORIDE. Heroin Hydrochloride, $C_{17}H_{17}NO\ (C_2H_3O_2)_2HCl$, eq. 402·64.—A white, odourless, crystalline powder.

Solubility.—1 in 2 of Water; 1 in 11 Alcohol (90 p.c.); insoluble in Ether.

The solubility of Heroin Hydrochloride was carefully determined in the author's laboratory, and the above figures represent the results of numerous determinations. Continental samples of the salt had a solubility of 1 in 2 of Water, which is that also given by the manufacturer.

Dott states (*C.D.* '05, i. 489; *P.J.* '05, i. 440) that the Hydrochloride appears to contain $2H_2O$, one molecule of which is lost under 100° C. (212° F.), the remaining portion at 120° C. (248° F.). Samples of Continental make examined in the author's laboratory showed a loss at 100° C. (212° F.) of 1·2 p.c., at 120° C. 1·8 p.c.

Medicinal Properties.—Introduced as a substitute for Morphine, it being stated to possess the advantages of not causing constipation and of being active in much smaller doses. Has been found useful in acute and chronic bronchitis, bronchial asthma, the cough of phthisis, in acute pneumonia and in pertussis.

Result of five years' experience in the use of this drug in simple bronchitis, bronchitis with measles, the bronchitis of influenza, chronic catarrhal bronchitis, phthisis and pneumonia: its effects as a cough-relieving agent were prompt and definite, and in the case of almost incessant cough or severe paroxysms during the night its good effects were especially noticeable, whilst in phthisis its use was followed by most satisfactory results. In chronic bronchial catarrh it seems to have a positive curative value. In measles, when the bronchial irritation was prominent, nothing else was found as serviceable.—*L.* '00, i. 180.

Has been recommended in the treatment of the morphia habit, but its use is deprecated on the ground that the craving following its use is infinitely more unmanageable than is that of Morphine.—*B.M.J.E.* '01, ii. 24; *L.* '01, ii. 263; *B.M.J.E.* '07, i. 87.

Dose.—$\frac{1}{24}$ to $\frac{1}{6}$ grain = 0·0027 to 0·01 gramme.

It is advisable to commence with the smaller dose, as some persons are easily affected by it, and repeated doses of $\frac{1}{16}$ and $\frac{1}{12}$ grain have produced toxic symptoms.

Foreign Pharmacopœias.—Official in Jap., Swiss (Morphinum diacetylicum hydrochloricum); Russ. (Heronium hydrochloricum); Russ., maximum single dose, 0·01 gramme; maximum daily dose, 0·02 gramme; Swiss, maximum single, 0·005, maximum daily, 0·15; Jap., maximum single, 0·01, maximum daily, 0·03.

Tests.—Diacetyl-morphine Hydrochloride has a m.p. of 116° to 117° C. (240·8° to 242·6° F.). It dissolves readily in Water, yielding solutions which are neutral in reaction towards Litmus, and from which the free base is liberated, on the addition of Ammonia Solution or Sodium Bicarbonate Solution; the separated base should possess the m.p. and respond to the tests given under Heroin. The anhydrous Hydrochloride should contain theoretically 91 p.c. of Diacetyl-morphine, and the percentage of the latter may be determined by titrating a weighed quantity of the salt with Normal or Tenth-normal Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality, and adding sufficient Ether to retain the liberated alkaloid in solution. 1 c.c. of Normal Volumetric Sodium Hydroxide Solution represents 0·36645 gramme of Diacetyl-morphine or 0·40264 gramme of anhydrous Diacetyl-morphine Hydrochloride. Dott (*C.D.* '05, i. 489) has proposed the following test:—Dissolve a weighed quantity of 0·4 of a gramme of the salt in 4 c.c. of Water, add 0·1 of a gramme of Sodium Bicarbonate, allowing it to stand for several hours; a precipitate should be yielded which, when collected on a small filter, washed with 6 c.c. of Water and dried in a water-bath, should weigh 0·3 of a gramme. The majority of the samples examined in the author's laboratory, when assayed according to this test, showed a higher yield of residue than 0·3 gramme. The Hydrochloride should be free from the impurities mentioned under Heroin.

ELIXIR HEROIN CUM TERPENE.—Heroin, $\frac{1}{2}$ grain; Terpene Hydrate, 8 grains; Alcohol (90 p.c,), 6 fl. drm.; Syrup of Virginian Prune Bark, 3 fl. drm.; Glycerin, 3 fl. drm. Dose.—$\frac{1}{2}$ to 2 drm. = 1·8 to 7·1 c.c. (Each fl. drm. contains $\frac{1}{24}$ grain Heroin and $\frac{2}{3}$ grain Terpene Hydrate.)—*Bournemouth Formulary.*

Elixir Acetomorphinæ et Terpini.—Acetomorphine Hydrochloride, 0·10; Terpin Hydrate, 1; Alcohol, 45; Glycerin, 22·50; Syrup of Wild Cherry, *q.s.* to produce 100.—*B.P.C.*

The *B.P.C. Supplement* has changed the quanity of Alcohol to 50, and the quantity of Glycerin to 25.

GLYCERINUM HEROINÆ COMPOSITUM. *Syn.* Glycaphorm. —Heroin Hydrochloride, 10 grains; Chloroform, 20 minims; Syrup of Roses, 10 fl. oz.; Distilled Water, 2 fl. oz.; Alcohol, 40 minims; Glycerin, *q.s.* to make 20 fl. oz.

Dissolve the Heroin in the Water and add the syrup, gradually shaking after each addition. Dissolve the Chloroform in the Alcohol, add the syrup; then add Glycerin to 20 fl. oz.—*Pharm. Form.*

Glycerinum Acetomorphinæ.—Acetomorphine Hydrochloride, 0·05; Chloroform, 0·20; Alcohol (90 p.c.), 0·40; Syrup of Roses, 50; Distilled Water, 10; Glycerin, *q.s.* to make 100.—*B.P.C.*

Glycerinum Heroini Compositum.—Heroin, 20 grains; Ammonium Hypophosphite, 640 grains; Fluid Extract of Hyoscyamus, 320 minims; Fluid Extract of White Pine, $2\frac{2}{3}$ fl. oz.; Soluble Tincture of Tolu, 2 fl. oz.; Glycerin, 10 fl. oz.; Syrup of Wild Cherry Bark, 6 fl. oz.; Cinnamon Water, *q.s.* to make 40 fl. oz.—*Canadian Formulary* 1908.

LINCTUS HEROIN.—Heroin Hydrochloride, 2 grains; Tincture of Hyoscyamus, 4 fl. drm.; Spirit of Chloroform, 4 fl. drm.; Syrup of Tolu, 1 fl. oz.; Syrup of Virginian Prune Bark, 1 fl. oz.; Glycerin, *q.s.* to produce 6 fl. oz.

Mix. (Each fl. drm. contains $\frac{1}{24}$ grain of Heroin Hydrochloride). Dose.—$\frac{1}{2}$ to 2 fl. drm. = 1·8 to 7·1 c.c.—*Bournemouth Formulary.*

Linctus Acetomorphinæ.—Acetomorphine Hydrochloride, 0·10; Tincture of Hyoscyamus, 7·50; Spirit of Chloroform, 7·50; Syrup of Balsam of Tolu, 15; Syrup of Wild Cherry, 15; Glycerin, *q.s.* to produce 100.—*B.P.C.*

PASTILLI HEROIN.—Heroin Hydrochloride, 1 grain; Ammoniated Glycyrrhizin, 10 grains; Pumilio Pine Oil, 8 minims; Glyco-gelatin, sufficient to make 32 pastilles. Each pastille contains $\frac{1}{32}$ grain of Heroin Hydrochloride. —*Bournemouth Formulary.*

This has been incorporated in the *B.P.C.* as follows:—Pastillus Acetomorphinæ Compositus.—Acetomorphine Hydrochloride, $\frac{1}{32}$ grain; Ammoniated Glycyrrhizin, $\frac{5}{16}$ grain; Pine Oil, $\frac{1}{4}$ minim.—*B.P.C.*

BENZYL-MORPHINE HYDROCHLORIDE. Peronine, $C_{17}H_{18}NO_3.C_7H_7.HCl$, eq. 408·61. It may be prepared by the action of Benzyl Chloride on Morphine.

A bitter, odourless, white, micro-crystalline powder, soluble 1 in 200 of Water, 1 in 160 of Alcohol (90 p.c); insoluble in Chloroform and Ether.

Medicinal Properties.—Narcotic and sedative, introduced as a substitute for Morphine and Codeine in the irritative cough of phthisis and chronic bronchitis.—*B.M.J.E.* '98, ii. 43; *L.* '99, ii. 139.

An exhaustive report on Benzyl-morphine by Stockman and Dott; the remarks found under Diacetyl-morphine are also applicable to the Benzyl compound.—*L.* '90, ii. 191; '99, ii. 139.

Instillation of 1 to 2 p.c. solution into conjunctival sac induces anæsthesia of the cornea.—*B.M.J.E.* '99, ii. 71.

Dose.—$\frac{1}{8}$ to $\frac{1}{2}$ grain = 0·008 to 0·032 gramme.

Tests.—Benzyl-morphine Hydrochloride, when strongly heated, evolves a strong aromatic odour, the salt dissolves in Water, forming a solution neutral in reaction to Litmus, from which Ammonium, Potassium, or Sodium Hydroxide Solution precipitates the free base. It is precipitated by the usual alkaloidal reagents, *e.g.*, Potassium Mercuric Iodide (Mayer's) Solution, Iodo-Potassium Iodide (Wagner's) Solution, Picric Acid, etc. With Sulphuric Acid containing a trace of Nitric Acid it yields a dark brownish-red coloration. It is distinguished from Morphine by yielding no blue coloration with Potassium Ferricyanide Solution containing a few drops of Ferric Chloride T.S., and by its failure to liberate Iodine from Iodic Acid. It contains theoretically 91·1 p.c. of Benzyl-morphine, which may be determined by titration in a similar manner to that described under Diacetyl-morphine Hydrochloride. 1 c.c. of Volumetric Potassium

Hydroxide Solution represents 0·40861 gramme of anhydrous Benzyl-morphine Hydrochloride, $C_{17}H_{18}NO_3(C_7H_7)HCl$.

MONO-ETHYL-MORPHINE HYDROCHLORIDE. Dionine, $C_{17}H_{18}NO_3 \cdot C_2H_5HCl.H_2O$, eq. 364·94.—A bitter, odourless, white, micro-crystalline powder.

Solubility.—1 in 7 of Water; 1 in 5 of Alcohol (90 p.c.); insoluble in Ether.

The above figures were carefully determined in the author's laboratory, and have been confirmed on repetition. The solubility of the salt in Alcohol (90 p.c.) varies greatly with the temperature, slight variations producing an appreciable effect; the salt which had a solubility in Alcohol (90 p.c.) at 15·5° C. (60° F.) of 1 in 5, dissolved readily 1 in 1 of warm Alcohol (90 p.c.). The figures for the solubility given by Dott (*C.D.* '05, i. 489) are 1 in 14 of Water, 1 in 29 of Alcohol (90 p.c.).

Medicinal Properties.—Analgesic, not a local anæsthetic.

Its regular and systematic use in the form of a 5 to 10 p.c. solution has been recommended (*B.M.J.* '04, ii. 1303) in interstitial keratitis. A 5 p.c. solution was found (*L.* '05, ii. 835) very beneficial in corneal opacities from recent keratitis. It is one of the most valuable agents we possess (*L.* '06, ii. 15; *F.T.* '07, i. 53) for the relief of deep-seated ocular pain, *e.g.*, in glaucoma, iritis, sclerotitis, etc.

As an analgesic (*B.M.J.* '06, i. 1098) it is used chiefly in the form of a 5 p.c. aqueous solution or made up with Vaseline as an ointment in similar strength. Not only an ocular anæsthetic, but a powerful ocular analgesic. It neither dilates the pupil nor increases the tension of the eye. It is advisable to begin with a 2 p.c. solution and gradually increase the strength so that in the course of a few days 5 p.c. may be used. Drops of a weak solution (1 or 2 p.c.) have given considerable relief in those cases, chiefly of neurotic and neurasthenic patients, where no disease or abnormality may be discoverable on careful examination, and yet the patient constantly complains of the feeling of soreness. No other method for the clearing up of corneal opacities can be compared with the results of the use of this drug. In the treatment of all forms of corneitis it may be used in 1 or 2 p.c. solution combined with Atropine. When the inflammatory symptoms have subsided, the Atropine is stopped, but the Dionine is continued alone for a considerable time. For the clearing up of corneal opacities, an ointment containing 4 grains to the oz. may be used to commence with, gradually increasing the strength to 12 grains to the oz.

As an ocular analgesic in 5 p.c. aqueous solution, or as an ointment of similar strength.—*B.M.J.* '04, i. 1009.

Has been found useful in relieving the cough of phthisis and bronchitis.—*B.M.J.E.* '99, i. 36; '01, ii. 68; '02, i. 60; *P.J.* '01, ii. 645.

In the treatment of the drug habit, ¼ to ½ grain doses.—*B.M.J.E.* '99, i. 83.

Dose.—⅓ to ½ grain = 0·021 to 0·032 gramme, dissolved in Water; or in the form of a syrup.

Official in Swiss. Swiss, maximum single dose, 0·05 gramme; maximum daily dose, 0·15 gramme.

Tests.—Mono-ethyl-morphine Hydrochloride melts at about 124° C. (255·2° F.). It dissolves in Water, forming a solution which is neutral in reaction towards Litmus and which yields precipitates with the usual alkaloidal agents, *e.g.*, Potassio-mercuric Iodide (Mayer's) Solution, Iodo-potassium Iodide (Wagner's) Solution, etc.

Sulphuric Acid dissolves Dionine, forming a clear colourless solution, and evolves simultaneously Hydrochloric Acid gas; the addition of 1 or 2 drops of Ferric Chloride T.S. produces on warming a violet coloration changing to a deep blue, which upon the further addition of 1 or 2 drops of Nitric Acid assumes a deep red coloration. With Sulphuric Acid Solution containing 0·5 p.c. of Ammonium Molybdate it yields a similar violet coloration to that of Morphine. If 0·5 of a gramme of Dionine be dissolved in 5 c.c. of Water it yields with Ammonia Solution (sp. gr. 0·910) a copious white precipitate which redissolves on the addition of about 5 c.c. of the Ammonia Solution, but the free base again separates in the form of crystals in a short time; Codeine under similar circumstances yields a precipitate which is permanently dissolved on the addition of 1 c.c. of the Ammonia Solution.

Ethyl-morphine may be distinguished from Morphine by yielding no immediate blue coloration or precipitate with a solution of Potassium Ferricyanide containing a trace of Ferric Chloride T.S. The anhydrous salt contains theoretically 85 p.c. of Ethyl-morphine, it is neutral in reaction towards Phenolphthalein and may be titrated in a similar manner to Diacetyl-morphine Hydrochloride. 1 c.c. of Normal Volumetric Sodium Hydroxide Solution represents 0·36494 gramme of anhydrous Mono-ethyl-morphine Hydrochloride. It should be free from the impurities mentioned under Diacetyl-morphine Hydrochloride.

MORPHINÆ ACETAS.

MORPHINE ACETATE.

$C_{17}H_{19}NO_3, C_2H_4O_2, 3H_2O$, eq. 396·27.

FR., ACETATE DE MORPHINE; GER., MORPHINACETAT; ITAL., ACETATO DI MORFINA; SPAN., ACETATO MORFICO.

A light, white, crystalline powder, possessing a faint acetous odour and a bitter taste. It gradually loses Acetic Acid when exposed to the air, and should therefore be kept in well-stoppered glass bottles of a dark amber tint and exposed as little as possible to the atmosphere.

Solubility.—Theoretically 1 in 2½ of Water, but most samples will require the addition of Acid; 1 in 100 of Alcohol (90 p.c.); 1 in 5 of Glycerin.

It has been stated (*C.D.* '05, i. 282) that the solubility for Morphine Acetate would be better described as 1 in 3 of Water.

Medicinal Properties.—*See* Morphinæ Hydrochloridum.

The Injectio Morphinæ Hypodermica formerly (*B.P.* 1885) contained one grain of Morphine Acetate in ten minims, now (*B.P.* 1898) it contains one grain of Morphine Tartrate in twenty-two minims.
Recommended in diabetes.—*Pr.* xxxviii. 20; *B.M.J.* '89, i. 118.

Dose.—⅛ to ½ grain = 0·008 to 0·032 gramme.

Prescribing Notes.—*As it is practically impossible to dry the salt without a slight loss of Acetic Acid, the commercial Acetate generally requires a little added Acetic Acid to make a clear solution. Aqueous solutions have a strong tendency to deposit a basic Morphine Acetate, and to become acid.*

Incompatibles.—Alkalis and alkaline earths, astringent vegetable infusions and decoctions.

Official Preparation.—Liquor Morphinæ Acetatis.

Not Official.—Injectio Morphinæ et Atropinæ Hypodermica.

Antidotes.—*See* Morphine Hydrochloride.

Foreign Pharmacopœias.—Official in Belg., Mex., Port. and U.S. Not in the others.

Tests.—Morphine Acetate when heated loses Water and Acetic Acid and melts, according to the *U.S.P.*, at about 200° C. (392° F.).

It affords upon the addition of Ammonia Solution, in slight excess, a white precipitate rapidly becoming crystalline, and if this precipitate is separated, washed with a little cold Morphinated Water and dried, it responds to the tests described under Morphine. A small quantity of the salt warmed with a little Sulphuric Acid and 1 or 2 c.c. of Alcohol (90 p.c.) yields a characteristic odour of Ethyl Acetate. The test for Acetates with Ferric Chloride Test-solution cannot be employed unless the alkaloid is first removed, owing to the reaction of the Morphine which produces a greenish-blue destroyed by acids or by heat. When warmed with Sulphuric Acid it evolves an odour of Hydrogen Acetate. It is officially required to yield 71 p.c. of anhydrous Morphine equivalent to 75·4 p.c. of hydrated Morphine and to 99·4 p.c. of a salt of the pharmacopœial formula, as gravimetrically determined by dissolving 2 grammes of the salt in a mixture of 6 c.c. of warm Morphinated Water and 0·1 c.c. of Acetic Acid and precipitating this solution with Ammonia Solution in slight excess, the precipitate being washed with a little cold Morphinated Water, dried first by pressure between sheets of bibulous paper, and then at a temperature of 55° to 60° C. (131° to 140° F.), and eventually at a temperature of 110° C. (230° F.); the crystals should weigh 1·42 grammes. The *B.P.* states that in the event of the salt yielding a larger proportion of Morphine than this, before use it should be recrystallised from hot Water acidulated with Acetic Acid. It should be free from the impurities mentioned under Morphine; when ignited with free access of air the salt should leave no weighable residue, indicating the absence of mineral impurity.

Preparation.

LIQUOR MORPHINÆ ACETATIS. Solution of Morphine Acetate.

Morphine Acetate, 17½ grains; Diluted Acetic Acid, 38 minims; Alcohol (90 p.c.), 1 fl. oz.; Distilled Water, *q.s.* to yield 4 fl. oz. (1 in 100)

Dose.—10 to 60 minims = 0·6 to 3·6 c.c.

11 minims contain $\frac{1}{10}$ grain.

Not Official.

INJECTIO MORPHINÆ ET ATROPINÆ HYPODERMICA.—Morphine Acetate, 10 grains; Atropine Sulphate, ¼ grain; Water, 120 minims; dissolve.

½ grain of Morphine Acetate and $\frac{1}{80}$ grain of Atropine Sulphate in every 6 minims.

Dose.—1 to 6 minims for each injection = 0·06 to 0·36 gramme.

Atropine combined with Morphine increases its analgesic and hypnotic effects, whilst it lessens the tendency to sickness, dyspepsia, depression and constipation.

The *B.P.C.* solution contains 6 p.c. of Morphine Sulphate and 0·12 p.c. of Atropine Sulphate.

Not Official.

MORPHINÆ HYDROBROMIDUM.

MORPHINE HYDROBROMIDE.

$C_{17}H_{19}NO_3$, HBr, $2H_2O$, eq. 399·16.

Forms long, colourless needles, soluble 1 in 25 Water, 1 in 50 of Alcohol (90 p.c.). It is employed for similar purposes to the Hydrochloride.

Dose.—⅛ to ½ grain = 0·008 to 0·032 gramme.

Tests.—Morphine Hydrobromide loses at a temperature of 100° to 110° C. (212° to 230° F.) two molecules of Water of crystallisation, equivalent to 8·9 p.c. It dissolves in Water, yielding a solution which is neutral or but faintly acid to Litmus paper; on the addition of a slight excess of Ammonia Solution it yields a precipitate rapidly becoming crystalline, which, when separated, washed and dried, answers the tests characteristic of Morphine given under that heading. The aqueous solution yields with Silver Nitrate Solution a yellowish curdy precipitate which, when separated and washed, dissolves readily in Potassium Cyanide Solution, but which is practically insoluble in Ammonia Solution and insoluble in Nitric Acid. It contains theoretically 70·9 p.c. of anhydrous Morphine, equivalent to 75·4 p.c. of hydrated Morphine, which may be gravimetrically determined by methods similar to those described under Morphine Acetate, Hydrochloride, and Tartrate. It should be free from the impurities mentioned under Morphine, and the salt, when ignited with free access of air, should leave no weighable residue.

MORPHINÆ HYDROCHLORIDUM.

MORPHINE HYDROCHLORIDE.

HYDROCHLORATE OF MORPHINE.—*B.P.* '85.

$C_{17}H_{19}NO_3$, HCl, $3H_2O$, eq. 372·88.

FR., CHLORHYDRATE DE MORPHINE; GER., MORPHINHYDROCHLORID; ITAL., CLORIDRATO DI MORFINA; SPAN., CLORURO MORFICO.

White, odourless, lustrous, silky needles, or a white microcrystalline powder, possessing a bitter taste.

Solubility.—1 in 24 of Water; about 1 in 72 of Alcohol (90 p.c.); 1 in 8 of Gycerin; insoluble in Ether.

The above figure for Morphine Hydrochloride in Water has been confirmed on repetition; the figure for Alcohol (90 p.c.) has been altered from 1 in 50 to 1 in 72, the former figure represented the solubility in Rectified Spirit of the *B.P.* 1885; the increased strength of the Alcohol official in *B.P.* 1898 causing a corresponding difference in solubility. The Report of the Committee of Reference in Pharmacy recommends the solubility of 1 in 25 of Water, and states that 1 gramme dissolves in 69 c.c. of Alcohol (90 p.c.). It should be kept in well-stoppered bottles of a dark amber tint.

Medicinal Properties.—Morphine possesses in a marked degree the analgesic and hypnotic effects of Opium. It has the advantage over Opium of being less apt to disturb digestion and cause constipation, more particularly when given by hypodermic injection; it is also less likely to cause headache and nausea. It is more readily absorbed and acts quicker; it is better adapted for hypodermic injection and for suppositories. Opium, however, is better for relieving pain in the alimentary tract, as in gastric ulcer and abdominal pain; it is also more useful as a diaphoretic and in diabetes. It lessens the secretions, diminishes diarrhœa, and produces constipation. Children are very susceptible to the action of Morphine.

Valuable papers on its use in cardiac diseases, *L.* '98, ii. 1393, and on Opium in acute and chronic disease, *Pr.* '07, i. 625.

Given immediately before the general anæsthetic or before the patient leaves the table, prevents post-anæsthetic vomiting.—*L.* '08, i. 292.

A hypodermic injection given before the administration of a general anæsthetic decreases the patient's susceptibility to shock during the operation.—*L.* '05, i. 853.

Amongst the various references to Morphine or Morphine salts, $\frac{1}{6}$ to $\frac{1}{3}$ grain has been recommended hypodermically (*B.M.J.* '04, ii. 1635, 1783) in the treatment of hæmoptysis. An exception to the exhibition of Morphine (*B.M.J.* '05, i. 68) is found when the bleeding is so profuse as to flood the air passages, and threatens to suffocate the patient.

Morphinomania treated successfully by Atropine and Strychnine.—*B.M.J.* '07, i. 1173.

In the treatment of puerperal eclampsia, injection of $\frac{1}{8}$ to 1 grain.—*B.M.J.* '01, ii. 810; '02, i. 71, 509; '05, ii. 718, 719, 749; *L.* '01, i. 1823; *T.G.* '01, 622.

Dose.—$\frac{1}{8}$ to $\frac{1}{2}$ grain = 0·008 to 0·032 gramme.

Ph. Ger. maximum single dose, 0·03 gramme; maximum daily dose, 0·1 gramme.

Prescribing Notes.—*The salts of Morphine are all readily soluble in Water, the Acetate being the most soluble, but it is apt to deposit a basic salt; the Tartrate and Lactate are next, being about* 1 *in* 10; *the Sulphate, Hydrobromide and Hydrochloride are the least soluble, requiring rather more than* 20 *of Water to* 1 *of the salt.*

Incompatibles.—Alkalis and alkaline earths, astringent vegetable infusions and decoctions, Ferric Chloride.

Official Preparations.—Liquor Morphinæ Hydrochloridi, Suppositoria Morphinæ, Trochiscus Morphinæ and Trochiscus Morphinæ et Ipecacuanhæ. Contained in Tinctura Chloroformi et Morphinæ Composita.

Not Official.—Insufflatio Morphinæ, Linctus Morphinæ (*Squire*), Linctus Morphinæ Acidus (*Squire*).

Antidotes.—If taken by the mouth, induce vomiting, and wash out the stomach. Keep the patient walking about, and rouse him in every way. Ammonia or Spirit of Sal Volatile to the nose, inject a pint of strong Coffee into the bowel. Hypodermic injection of Atropine Sulphate $\frac{1}{20}$ grain, repeating in a quarter of an hour if necessary. Tincture of Belladonna, Amyl Nitrite inhalation, artificial respiration.—*Murrell.* $\frac{1}{32}$ grain Strychnine acts as an antidote to $\frac{1}{2}$ grain Morphine.—*L.* '71, ii. 840, 907. Potassium Permanganate is used to wash out the stomach; a solution of 120 minims of Liq. Pot. Permang. in a pint of Water is suitable. If quantity of Opium or Morphine taken is unknown, 8 to 10 grains Potassium Permanganate in from 4 to 8 fl. oz. of Water should be administered at once. The solution may be acidulated with Acid. Sulphuricum Dilutum with advantage.—*B.M.J.* '95, i. 1369; '95, ii. 55, 76; '96, i. 1194; *T.G.* '98, 97. Picrotoxine, $\frac{1}{20}$ grain.—*L.* '89, i. 497. $\frac{1}{2}$ grain doses of Cocaine at intervals of half an hour until consciousness returns and breathing is normal, as an antidote.—*M.P.* '02, i. 147; *P.J.* '02, i. 114.

Case of poisoning by 8 grains of Morphine Sulphate (in three hypodermic injections), treated by artificial respiration, subcutaneous injection of 30 oz. of normal saline solution, and drinking a diluted solution of Potassium Permanganate.—*L.* '02, i. 1317.

Value of Oxygen in poisoning by Morphine.—*L.* '98, ii. 545.

Foreign Pharmacopœias. Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—Morphine Hydrochloride when heated to 100° C. (212° F.) loses its Water of crystallisation, equivalent to 14·4 p.c., and when still more strongly heated chars without melting. The German Pharmacopœia states that it loses 14·4 p.c. of its weight at 100° C. (212° F.), and that the anhydrous Morphine Hydrochloride should be of a pure white or only of a pale yellow colour; when heated to 250° C. (482° F.) it changes to a brown colour.

It dissolves in Water, yielding a solution neutral in reaction towards Litmus paper; when the solution is treated with a slight excess of Ammonia Solution it yields a white precipitate rapidly becoming crystalline, which, when separated and washed with Morphinated Water and carefully dried, answers tests characteristic of Morphine given under that heading. The aqueous solution acidified with Nitric Acid yields on the addition of Silver Nitrate Solution a white curdy precipitate, which when separated dissolves readily in Ammonia Solution and in solution of Potassium Cyanide, but is insoluble in Nitric Acid. When warmed with Sulphuric Acid it evolves Hydrochloric Acid gas. It is officially required to contain 75·5 p.c. of anhydrous Morphine, equivalent to 80·2 p.c. of hydrated Morphine and to 99·5 p.c. of pure Morphine Hydrochloride of the pharmacopœial formula as gravimetrically determined by dissolving 2 grammes of the salt in 250 c.c. of warm Morphinated Water, precipitating the Morphine with the smallest possible excess of Ammonia Solution, filtering, washing the crystalline precipitate with a little cold Morphinated Water, and drying first between folds of bibulous paper, then at a temperature of 55° to 60° C. (131° to 140° F.) and finally at a temperature of 110° C. (230° F.); the crystals should weigh 1·51 grammes.

The Report of the Committee of Reference in Pharmacy recommends that the 2 grammes of the salt employed in the above quantitative estimation should be dissolved in 50 c.c. instead of 250 c.c. of warm Morphinated Water, and the precipitated Morphine should weigh 1·5 to 1·51 grammes. Morphine Hydrochloride should be free from the impurities mentioned under Morphine. The *U.S.P.* states that on the addition of Potassium Carbonate T.S. to a 1 in 30 aqueous solution of the salt a white precipitate should be formed, which should be soluble without colour in Chloroform indicating the absence of Apomorphine. The Benzol test is given under Morphina.

Potassium Carbonate.—5 c.c. of an aqueous solution of the salt (1–30) should give immediately, or after a few seconds, with 1 drop of Potassium Carbonate T.S., a pure white crystalline precipitate which even on exposure to the air undergoes no coloration. When agitated with Chloroform no red colour should be developed, *P.G.;* the white precipitate formed should dissolve in Chloroform without colour, *U.S.P.*

Ether.—If the solution of this precipitate in Sodium Hydroxide T.S. be agitated with an equal volume of Ether, the separated ethereal layer when evaporated to dryness should not leave a weighable residue, *P.G.*

Potassium Hydroxide.—An aqueous solution of the salt yields a white precipitate with Potassium Hydroxide T.S., readily soluble in excess, *B.P.*

Preparations.

LIQUOR MORPHINÆ HYDROCHLORIDI. SOLUTION OF MORPHINE HYDROCHLORIDE. *B.P.Syn.*—SOLUTION OF HYDROCHLORATE OF MORPHINE.

Morphine Hydrochloride, 17$\frac{1}{2}$ grains; Diluted Hydrochloric Acid 38 minims; Alcohol (90 p.c.), 1 fl. oz.; Distilled Water, *q.s.* to yield 4 fl. oz. (1 in 100)

Dose.—10 to 60 minims = 0·6 to 3·6 c.c.

11 minims contain $\frac{1}{10}$ grain of Morphine Hydrochloride.

Foreign Pharmacopœias.—Official in Fr. Soluté de Morphine (Chlorhydrate) pour Injection Hypodermique, 1 in 50; Port. (Soluto de Chlorhydrato de Morphina), 1 in 20, for hypodermic injection. Not in the others.

SUPPOSITORIA MORPHINÆ. MORPHINE SUPPOSITORIES.

$\frac{1}{4}$ grain of Morphine Hydrochloride in each, with Oil of Theobroma.

Half the strength of *B.P.* '85.

TINCTURA CHLOROFORMI ET MORPHINÆ COMPOSITA.

The formula is given under Chloroform. The proportion of Morphine has been much increased, and is now more than four times what it was in *B.P.* '85. 10 minims now contain $\frac{3}{4}$ minim of Chloroform, $\frac{1}{2}$ Minim of Diluted Hydrocyanic Acid, $\frac{1}{11}$ grain of Morphine Hydrochloride, and 1 minim of Tincture of Indian Hemp.

TROCHISCUS MORPHINÆ. MORPHINE LOZENGE.

$\frac{1}{36}$ grain of Morphine Hydrochloride in each lozenge, with Tolu Basis.

Dose.—1 to 6 lozenges. One occasionally for cough.

Official in Jap. (Pastilli Morphini Hydrochlorici), 0·005 gramme in each pastille.

TROCHISCUS MORPHINÆ ET IPECACUANHÆ. MORPHINE AND IPECACUANHA LOZENGE.

$\frac{1}{36}$ grain of Morphine Hydrochloride, and $\frac{1}{12}$ grain of powdered Ipecacuanha Root in each, with Tolu Basis.

Dose.—1 to 6 lozenges. One occasionally for cough.

Foreign Pharmacopœias.—Official in U.S. contains $\frac{1}{40}$ grain of Morphine Sulphate, and $\frac{2}{25}$ grain of Ipecacuanha in each; Swiss (Pastilli Ipecacuanhæ cum Opio), contains about 0·002 gramme = $\frac{1}{32}$ grain of each, Ipecac. and Opium. Jap. (Pastilli Opii et Ipecacuanha). Each pastille contains 0·025 gramme = about $\frac{1}{3}$ grain of each, Opium and Ipecacuanha.

Not Official.

INSUFFLATIO MORPHINÆ.—Morphine Hydrochloride, $\frac{1}{4}$ grain; Bismuth Oxychloride, 1 grain; Starch, $\frac{1}{2}$ grain.—*City Chest.*

The Morphine Insufflations of *Royal Chest* are dilutions with Milk Sugar, and those of *Throat* and *Great Northern*, with dried Starch.

LINCTUS MORPHINÆ (*Squire*).—Solution of Morphine Hydrochloride, 3 minims; Spirit of Chloroform, 3 minims; Glycerin, 30 minims; Syrup, to 1 fl. drm.

LINCTUS MORPHINÆ ACIDUS (*Squire*).—Solution of Morphine Hydrochloride, 3 minims; Spirit of Chloroform, 3 minims; Lemon Juice, 15 minims; Glycerin, to 1 drm.

Both the above are very palatable.

This has been incorporated in the *B.P.C.* under title **Linctus Sedativus.** *Syn.*—Linctus Morphinæ Acidus.

Not Official.

MORPHINÆ LACTAS.

Morphine Lactate, $C_{17}H_{19}NO_3C_3H_6O_3$, eq. 372·42, occurs in colourless, prismatic crystals.

Solubility.—1 in 8 of Water, 1 in 93 of Alcohol (90 p.c.).

Dose.—$\frac{1}{8}$ to $\frac{1}{2}$ grain = 0·008 to 0·032 gramme.

Not Official.

MORPHINÆ SULPHAS.

Morphine Sulphate $(C_{17}H_{19}NO_3)_2$, H_2SO_4, $5H_2O$, eq. 752·84, occurs in colourless acicular crystals.

Solubility.—1 in 21 of Water, freely in hot Water; 1 in 700 of Alchhol (90 p.c.).

Dose.—$\frac{1}{8}$ to $\frac{1}{2}$ grain = 0·008 to 0·032 gramme.

Foreign Pharmacopœias.—Official in Jap., Mex., Norw., Port., Span. and U.S. Not in the others.

Tests.—Morphine Sulphate loses 3 molecules of Water of crystallisation, equivalent to 7·12, p.c. at 100° C. (212° F.). When strongly heated [about 250° C. (482° F.)] it changes to a brown colour and finally chars without melting. It dissolves in Water, yielding a clear solution which is neutral in reaction towards Litmus paper; this solution affords with Ammonia Solution a white crystalline precipitate, which should answer the tests characteristic of Morphine given under that substance. It should afford with Barium Chloride T.S. a white precipitate insoluble in Hydrochloric Acid. It contains theoretically 75·2 p.c. of anhydrous Morphine, and may be gravimetrically determined by a similar process to that given for Morphine Acetate, Hydrochloride, or Tartrate.

LIQUOR MORPHINÆ SULPHATIS.—Sulphate of Morphine, 1; Rectified Spirit, 25; Distilled Water, *q.s.* to produce 100.—*B.P.* 1885.
This has been incorporated in the *B.P.C.*

PULVIS MORPHINÆ COMPOSITUS.—Morphine Sulphate, 1·5; Camphor, 32; Glycyrrhiza in No. 80 powder, 33; Precipitated Calcium Carbonate, 33·5; Alcohol, *q.s.* Rub the Morphine Sulphate with the Precipitated Calcium Carbonate, added in portions of about 5 each, until it is thoroughly mixed, then rub the Camphor with a little Alcohol and mix intimately with the Glycyrrhiza and the other powders. Finally, pass the powder through a No. 40 sieve, pulverise the residue if any should be left on the sieve, add to the sifted powder and mix thoroughly. Transfer it to well-stoppered bottles. Average Dose, 7½ grains = 0·5 gramme.—*U.S.P.*
This has been incorporated in the *B.P.C.*

PILULÆ ATROPINÆ ET MORPHINÆ. *See* p. 204.

MORPHINÆ TARTRAS.

MORPHINE TARTRATE.

$(C_{17}H_{19}NO_3)_2C_4H_6O_6,3H_2O$, eq. 768·66.

FR., TARTRATE DE MORPHINE; GER., MORPHINTARTRAT; ITAL., TARTRATO DI MORFINA; SPAN., TARTRATO MORFICO.

Colourless, acicular crystals, or as a fine, white, crystalline powder.

It may be prepared by the combination of Morphine with its molecular equivalent of Tartaric Acid.

Solubility.—1 in 10 of Water; sparingly in Alcohol (90 p.c.).

The solubility of this salt is sometimes affected by the presence of a small quantity of the Acid Tartrate; the latter being much less soluble than the official salt.

Dose.—$\frac{1}{8}$ to $\frac{1}{2}$ grain = 0·008 to 0·032 gramme.

Official Preparations.—Injectio Morphinæ Hypodermica and Liquor Morphinæ Tartratis.

Tests.—Morphine Tartrate dissolves in Water, forming a solution which is neutral in reaction towards Litmus paper, the solution yields, on the addition of Ammonia Solution in slight excess, a white precipitate rapidly becoming crystalline, which when separated yields the tests distinctive of Morphine described under that heading. The aqueous solution after the removal of the alkaloid, when mixed with Calcium Chloride Solution in excess, affords a white granular precipitate which, when separated and washed, is soluble in concentrated Potassium Hydroxide Solution; when a sufficiently concentrated solution is mixed with concentrated Potassium Acetate Solution it affords, when acidulated with Acetic Acid, a white crystalline precipitate; the precipitation being still more marked in the presence of Alcohol (90 p.c.); Ferrous Sulphate Solution added to a solution acidulated with Acetic Acid, followed by the addition of a few drops of Hydrogen Peroxide Solution, and finally with an excess of Potassium Hydroxide Solution, gives a purple or violet coloration. It is officially required to yield 73·5 p.c. of anhydrous Morphine equivalent to 78·13 p.c. of hydrated Morphine as gravimetrically determined by dissolving 2 grammes of the salt in 20 c.c. of warm Morphinated Water, precipitating the alkaloid with the slightest possible excess of Ammonia Solution, washing the crystalline precipitate with cold Morphinated Water and drying first between folds of bibulous paper, then at a temperature of 55° to 60° C. (131° to 140° F.), and finally at a temperature of 110° C. (230° F.); the crystals should weigh 1·47 grammes. It should be free from the impurities mentioned under Morphina, and when ignited with free access of air the salt should leave no weighable residue.

The salt is efflorescent at 20° C. (68° F.), and it should therefore be kept in well-stoppered glass bottles of a dark amber tint and kept as far as possible from contact with the air and in a cool place. It has a tendency, when kept for a lengthened period, to become converted into the Acid Tartrate, which dissolves with less facility in Water, and the presence of any appreciable proportion of such a salt is at once manifest by the increased insolubility in Water.

Preparations.

INJECTIO MORPHINÆ HYPODERMICA. HYPODERMIC INJECTION OF MORPHINE.

Dissolve 50 grains of Morphine Tartrate in recently boiled and cooled Distilled Water to produce 1100 minims. (1 in 20)

Dose.—*By subcutaneous injection,* 2 to 5 minims = 0·12 to 0·3 c.c.

The official Hypodermic Injection is now made with the Tartrate, containing 1 grain in 22 minims, which is about half the strength of that in *B.P.* '85. On account of the great difference in strength of the various solutions of Morphine salts, it is extremely important that they should be very plainly labelled, and used with very great care. It is also desirable that prescribers should clearly define the strength.

Tablets for making the injection are convenient and portable.

Atropine Sulphate, $\frac{1}{200}$ to $\frac{1}{100}$ grain is added to each dose of Morphine Injection to increase its analgesic and hypnotic effects, and to lessen its depressing and constipating effects.

LIQUOR MORPHINÆ TARTRATIS. Solution of Morphine Tartrate.

Morphine Tartrate, 17½ grains; Alcohol (90 p.c.), 1 fl. oz.; Distilled Water, *q.s.* to yield 4 fl. oz. (1 in 100)

Dose.—10 to 60 minims = 0·6 to 3·6 c.c.

11 minims contain $\frac{1}{10}$ grain.

MORRHUÆ OLEUM.

COD-LIVER OIL.

N.O.Syn.—Oleum Jecoris Aselli.

Fr., Huile de Foie de Morue; Ger., Leberthran; Ital., Olio di Fegato di Merluzzo; Span., Aceite de Higado de Bacalao.

A pale yellow, or yellow oily fluid, possessing a characteristic fishy odour and taste; extracted from the fresh liver of the Cod, *Gadus Morrhua*, at a temperature not exceeding 82·2° C. (180° F.); subsequently removing solid fat by filtration at about −5° C. (23° F.).

The alkaloids Morrhuine and Aselline have been isolated.

Solubility.—Sparingly in Absolute Alcohol; 1 in 2 of Ether; 1 in 3½ to 4 of Acetic Ether.

A solvent of pure Quinine. 1 fl. oz. at 140° F. will dissolve 4 grains readily.

Medicinal Properties.—Nutritive; nervine and hæmatinic tonic. Most efficient in all forms of tubercular disease and in rickets and tertiary syphilis; useful in the chronic eczema and chronic bronchitis of children; and generally in all cases of impaired nutrition and nervous debility due to over-work, acute disease, or under-feeding. In pulmonary consumption it deservedly possesses a high reputation: given in emulsion, with or without Malt Extract. It is contra-indicated in hæmoptysis, diarrhœa, and dyspepsia. It is easily assimilated, and is best given after meals, but it may produce indigestion and nausea; sometimes administered by inunction, but the odour is objectionable.

It is stated (*Edin. Med. Journ.* '05, 463) to be pre-eminently the best of the tonic remedies which have been used in the treatment of pulmonary tuberculosis. It should be taken twice a day within half an hour after meals. Best to commence with 1 drm. doses and after a time to increase to 2 drm. doses; the amount should never exceed ½ oz. For children Parrish's Food or Iron Wine is a good vehicle.

Dose.—1 to 4 fl. drm. = 3·6 to 14·2 c.c.

Prescribing Notes.—*Numerous and varied methods have been adopted for covering the taste of the Oil. It has been given floating on Orange Wine, Orange*

Juice, Milk, Coffee, also in a mixture of Tincture of Orange, diluted mineral Acid and Syrup. A favourite form is that of the **Emulsion** *which may be made with Gum Acacia, Tragacanth, or yolk of egg or any combination of these; another and very excellent method is that given under Malt Extract, see p.* 270. *The Oil by itself may be given in capsules containing* 30 *or* 60 *minims in each.*

Not Official.—Cremor Morrhuæ Pancreaticus, Emulsion d'Huile de Foie de Morue, Emulsio Olei Morrhuæ, Emulsio Olei Morrhuæ cum Hypophosphitibus, Ovis et Vino, Emulsio Morrhuæ Pancreatica, Emulsio Morrhuæ Pancreatica cum Extracto Malti, Emulsio Olei Morrhuæ Composita, Emulsum Olei Morrhuæ cum Hypophosphitibus, Huile de Foie de Morue Créosotée, Huile de Foie de Morue Phosphorée, and Morrhuol.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Ger., Hung., Norw., Russ., Swed. and Swiss (Ol. Jecoris Aselli); Fr. (Huile de Foie de Morue); Ital. (Oleo di Fegato di Merluzzo); Jap. (Ol. Jecoris; Port. (Oleo de Bacalhau); Mex. and Span. (Aceite de Higado de Bacalao); U.S. (Oleum Morrhuæ). Dutch and Swed. have also Oleum Jecoris Aselli Ferratum. Dutch has also Oleum Jecoris Aselli cum Iodeto Ferroso; Swiss has also Oleum Jecoris Iodetum.

Tests.—Cod-Liver Oil is officially required to possess a sp. gr. of 0·920 to 0·930. Fifteen samples examined in the author's laboratory had a sp. gr. of 0·922 to 0·928, with an average of 0·925. The *U.S.P.* states 0·918 to 0·922 at 25° C. (77° F.); the *P.G.* 0·926 to 0·931. The Oil is officially required to be readily soluble in Ether and in Chloroform and slightly soluble in Alcohol (90 p.c.). A violet coloration is developed when a drop of Sulphuric Acid is added to a few drops of Oil on a porcelain tile. The *U.S.P.* includes a test in which Sulphuric Acid is added to a chloroformic solution of the Oil, the *P.G.* one in which the Acid is added to the Carbon Bisulphide Solution of Oil. The *B.P.* requires that a precipitate of coagulated Albumen should be formed at the junction of the two liquids when Nitric Acid is carefully poured on to the surface of some Oil contained in a test-tube. Neither the *U.S.P.* nor *P.G.* includes a test for Albumen with Nitric Acid. Exposure of the Oil for two hours to a temperature of 0° C. (32° F.) should not result in the separation of solid fat. The *P.G.* states that no solid fat, or only an insignificant amount, should separate on prolonged standing at 0° C. (32° F.). The Saponification value, the Iodine absorption and a determination of the amount of free fatty acid are important factors to be observed in judging of the purity of a specimen of Cod Oil. Cod-Liver Oil has a Saponification value of about 185, and an Iodine absorption of about 160. Fifteen samples examined in the author's laboratory had Saponification values from 181·4 to 190·4, with an average of 186·8, and Iodine absorptions from 147·3 to 165·1, with an average of 155·7. The *U.S.P.* requires a Saponification value of 175 to 185, and an Iodine absorption of not less than 140 nor more than 150; the *P.G.* a Saponification value of not more than 196·5 and an Iodine absorption of not less than 140 nor more than 152. The percentage of free acid varies from 0 p.c. in a very fine colourless Oil to 9 p.c. in dark-coloured samples altered by heat and long keeping; it may be determined by warming a weighed quantity of 5 or 10 grammes of the Oil with 20 c.c. of Alcohol (90 p.c.) and titrating with Tenth-normal Volumetric Sodium Hydroxide Solution, 1 c.c. of the Tenth-normal solution being equivalent to 0·028014 gramme of Oleic Acid. Good specimens require from 0·0 to 1·8 c.c. (average 1·3 c.c.) of Tenth-normal Volumetric Sodium Hydroxide Solution to neutralise the free acid contained in 5 grammes of the Oil, corresponding to from 0·0 to 1·0 p.c. (average 0·73 p.c.), of free Acid calculated as Oleic Acid. Fifteen samples examined in the author's laboratory showed from 0·0 to 1·0 p.c. of free Oleic Acid. The *U.S.P.* and *P.G.* limit of free Acid is that the Oil shall at the most have only a very slightly acid reaction towards blue Litmus paper moistened with Alcohol of the respective pharmacopœial strengths. Upon the acidity of the sample also depends the presence or absence of Albumen; fine oils with little acid show an Albumen ring on being floated upon Nitric Acid, sp. gr. 1·400.

The determination of the refractive index has been suggested (*C.D.* '02, i. 505) as a means of judging the purity of the Oil. The Norwegian Oil is stated to have a higher refractive index than Newfoundland Oil. The refractive figure of Newfoundland Oil is shown to vary between + 42 to + 44·45, whilst that of the Norwegian Oil varies between + 44 to + 48. Cod-Liver Oil produces a great increase in temperature when mixed with Sulphuric Acid (Maumené), which distinguishes it from most other oils except liver oils. For the detection of Seal Oil and other fish oils the Nitric Acid colour test may be employed. Vegetable oils may be detected by the alteration in density and the reduction in the Iodine absorption. Refined Seal Oil, which has been frequently used as an adulterant, may be detected by the determination of the Saponification value, the Iodine absorption and rise of temperature with Sulphuric Acid.

Cod-Liver Oil contains from 1 to 1·5 p.c. of unsaponifiable matter, which may be determined by saponifying 5 grammes of the Oil with sufficient Alcoholic Potassium Hydroxide Solution to ensure complete saponification, evaporating off the Alcohol on a water-bath, dissolving the residue in hot Water, transferring to a separator, cooling, and when cold shaking out with Ether; the Ether is evaporated off, the residue dried at 100° to 105° C. (212° to 221° F.) till constant in weight; when dissolved in a little Carbon Bisulphide and tested with Sulphuric Acid it should give a well-marked purple coloration.

Litmus.—The Oil should show only a very slightly acid reaction to blue Litmus paper previously moistened with Alcohol, *P.G.* and *U.S.P.*

Sulphuric Acid.—A few drops of the Oil on a porcelain slab give a violet coloration with a drop of strong Sulphuric Acid, *B.P.* and *U.S.P.* A solution of 1 drop of Oil in 20 drops of Chloroform, shaken with 1 drop of Sulphuric Acid, acquires a violet-red tint, rapidly changing to rose-red and finally to brownish-yellow, *U.S.P.* A solution of 1 drop of the Oil in 20 drops of Carbon Bisulphide is coloured violet-red on the addition of 1 drop of Sulphuric Acid, the colour afterwards changing to brown, *P.G.*

Nitric Acid.—A mixture of 15 drops of Oil and 3 drops of fuming Nitric Acid gives a bright rose coloration, changing to lemon-yellow, *P.G.* If 2 or 3 drops of Nitric Acid be allowed to flow alongside of 10 to 15 drops of the Oil, contained in a watch-glass, a red colour will be produced at the point of contact; when the mixture is stirred, the colour becomes bright rose-red, changing soon to lemon-yellow. Seal Oil shows at first no change of colour, whilst other fish oils when examined by this test become at first blue and afterwards brown and yellow, *U.S.P.*

Elaïdin Test.—If a mixture of 1 c.c. of fuming Nitric Acid, 1 c.c. of Water and 2 c.c. of Cod-Liver Oil be carefully shaken together, it should neither wholly nor in part solidify within 1 or 2 days, *P.G.*

Iodine Absorption.—Dissolve about 0·3 gramme of the Oil in 10 c.c. of Chloroform in a 250 c.c. flask and add 25 c.c. of a mixture of equal parts of Alcoholic Iodine T.S. and Alcoholic Mercuric Chloride T.S. Allow the mixture to stand for 4 hours protected from light, then add 20 c.c. of Potassium Iodide T.S. and dilute with 50 c.c. of Water. Then, on titrating with Tenth-normal Volumetric Sodium Thiosulphate Solution, an Iodine value of not less than 140 nor more than 150 should be obtained, *U.S.P.;* about 0·5 gramme of the Oil is weighed into a stoppered bottle, dissolved in 15 c.c. of Chloroform, and 25 c.c. of Alcoholic Iodine Solution and Alcoholic Mercuric Chloride Solution added, and the mixture allowed to stand for 4 hours in a dark chamber protected from direct daylight; 1·5 gramme of Potassium Iodide and 100 c.c. of Water are added to the mixture, and the excess of Iodine is titrated with Tenth-normal Volumetric Sodium Thiosulphate Solution; 100 parts by weight of Cod-Liver Oil shall absorb not less than 140 and not more than 152 parts of Iodine, *P.G.*

Saponification.—If 1 gramme of the Oil be heated in a reflux condenser with 20 c.c. of Semi-normal Volumetric Potassium Hydroxide Solution for half an hour, and, after cooling and the addition of a few drops of Phenolphthalein T.S., the mixture be titrated with Semi-normal Hydrochloric Acid Volumetric Solution, not less than 13 c.c. of acid should be required for decoloration, *P.G.*

Not Official.

***CREMOR MORRHUÆ PANCREATICUS.**—Stronger Glycerin of Pepsin, 4; Glycerin of Pancreatin, 4; Cod-Liver Oil, 50; Decoction of Irish Moss, 27·50; Syrup of Tolu, 3; Alcohol, 3; Essential Oil of Almonds, 0·10; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

***EMULSIO MORRHUÆ PANCREATICA.**—Glycerin of Pancreatin, 2·50; Stronger Glycerin of Pepsin, 2·50; Cod-Liver Oil, 40; Gluside, 0·025; Solution of Potassium Hydroxide, 1; Tragacanth, in powder, 2; Gum Acacia, in powder, 8; Oil of Cassia, 0·075; Oil of Bitter Almonds, 0·075; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

B.P.C. Supplement has altered the quantities as follows:—Glycerin of Pancreatin, 3·5; Stronger Glycerin of Pepsin, 3·5; Cod Liver Oil, 50; Gluside, 0·033; Solution of Potassium Hydroxide, 1·25; Tragacanth, in powder, 2·5; Gum Acacia, in powder, 10; Oil of Cassia, 0·1; Oil of Bitter Almonds, 0·1; Distilled Water, *q.s.* to produce 100.

***EMULSIO MORRHUÆ PANCREATICA CUM EXTRACTO MALTI.**—Glycerin of Pancreatin, 9; Cod-Liver Oil, 40; Gum Acacia, in powder, 2; Tragacanth, in powder, 0·25; Saccharated Solution of Lime, 2; Extract of Malt, *q.s.* to produce 100.—*B.P.C.*

B.P.C. Supplement has altered the quantities as follows:—Glycerin of Pancreatin, 10; Cod Liver Oil, 50; Gum Acacia, in powder, 2·5; Tragacanth, in powder, 0·31; Saccharated Solution of Lime, 2·5; Extract of Malt, *q.s.* to produce 100 by volume.

EMULSIO OLEI MORRHUÆ.—Cod-Liver Oil, 8 fl. oz.; the Yolks of two Eggs; Tragacanth, in powder, 16 grains; Elixir of Gluside, 60 minims; Simple Tincture of Benzoin, 60 minims; Spirit of Chloroform, ½ fl. oz.; Essential Oil of Bitter Almonds, 8 minims; Distilled Water, to produce 16 fl. oz. Measure 5 fl. oz. of the Water; place the Tragacanth in a dry mortar and triturate with a little of the Cod-Liver Oil; then add the yolks of Eggs and stir briskly, adding Water as the mixture thickens. When of a suitable consistence, add the remainder of the Oil and Water alternately, with constant stirring, avoiding frothing.

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* These formulas closely resemble those previously published in *Armour's Formulary* (9th edition).

Transfer to a pint bottle, add the Elixir of Gluside, Tincture of Benzoin, Spirit of Chloroform and Oil of Almonds, previously mixed; shake well, and add Distilled Water if necessary to make the product measure 16 fl. oz. *B.P.C. Formulary* 1901, now incorporated in *B.P.C.* as follows:—

Emulsio Olei Morrhuæ Composita. Cod-Liver Oil, 50; Yolk of Egg, by volume, 6·50; Tragacanth, in powder, 0·25; Elixir of Gluside, 0·75; Simple Tincture of Benzoin, 0·75; Spirit of Chloroform, 3; Essential Oil of Bitter Almonds, 0·10; Distilled Water, *q.s.* to make 100.

Dose. 2 to 8 fl. drm. = 7·1 to 28·4 c.c.

This preparation can be medicated with any desired salt by dissolving such salt in the Water previous to making the emulsion; **Cod-Liver Oil Emulsion with Glycerophosphates** and **Cod-Liver Oil with Hypophosphites** are typical preparations. Substances soluble in the Oil should be added to it before emulsification.

Emulsum Olei Morrhuæ. Cod-Liver Oil, 500 c.c.; Gum Acacia, in powder, 125 grammes; Syrup, 62·5 c.c.; Oil of Bitter Almonds, 12 minims; Water, *q.s.* to make 1000 c.c.—*Proposed Canadian Addendum, P.J.* '99, ii. 231.

This has been incorporated in the *B.P.C.* as follows:—

Emulsio Olei Morrhuæ. Cod-Liver Oil, 50; Gum Acacia, in fine powder, 12·50; Syrup, 6·25; Oil of Bitter Almonds, 0·10; Distilled Water, *q.s.* to make 100.—*B.P.C.*

Cod-Liver Oil, 50; Powdered Acacia, 12·5; Solution of Gluside, 0·75 *or* Syrup of Tolu, 10; Water, *q.s.* to make 100. Flavouring as desired.—*Canadian Formulary* 1905; *C.F.* 1908 changed the quantity of Solution of Gluside to 0·7, but otherwise the formula is the same as 1905.

Emulsum Olei Morrhuæ. Cod-Liver Oil, 50; Acacia, in fine powder, 12·5; Syrup, 10; Oil of Gaultheria, 0·4; Water, *q.s.* to produce 100.—*U.S.P.*

The Oil of Gaultheria may be replaced if desired by a suitable quantity of Oil of Bitter Almond or other suitable flavouring.—*U.S.P.*

Émulsion d'Huile de Foie de Morue.—Put into a bottle 140 of Cod-Liver Oil, 4 drops of Essence of Almonds, 60 of Syrup, and 40 of Orange Flower Water; boil for 20 minutes 5 of Carrageen in sufficient quantity of water to obtain 220 of decoction. Strain with pressure through a cloth, and reduce the liquid by means of water-bath to 160, and pour the hot liquid into the bottle containing the other ingredients, agitate for 5 minutes, and then from time to time until cold; all by weight except the Essence of Almonds.—*Fr. Codex.*

Foreign Pharmacopœias.—Belg. (Jecoris Aselli Olei Emulsio), Carrageen 10, Water 500, make 450 parts of decoction. Mix, Tragacanth 1, Cod-Liver Oil 500, Anethol 2, Acetic Ether 1, Oil of Bitter Almonds 0·50. Add this mixture to the decoction and 50 parts of Glycerin. Span., (Emulsion de Aceite de Higado de Bacalao), Oil of Bitter Almonds 0·25, Carrageen 10, Glycerin 120, Cod-Liver Oil 500, Water to 1000.

EMULSUM OLEI MORRHUÆ CUM HYPOPHOSPHITIBUS.—Cod-Liver Oil, 50; Acacia, in fine powder, 12·5; Calcium Hypophosphite, 1; Potassium Hypophosphite, 0·5; Sodium Hypophosphite, 0·5; Syrup, 10; Oil of Gaultheria, 0·4; Water, *q.s.* to make 100.—*U.S.P.*

The Oil of Gaultheria may be replaced if desired by a suitable quantity of Oil of Bitter Almond or other suitable flavouring.—*U.S.P.*

Emulsio Olei Morrhuæ cum Hypophosphitibus, Ovis et Vino.—Cod-Liver Oil, 8 fl. oz.; Yolks of Eggs, 2; Powdered Tragacanth, 8 grains; Solution of Saccharine (15 p.c.), 1 fl. drm.; Simple Tincture of Benzoin, 1 fl. drm.; Spirit of Chloroform, 4 fl. drm.; Essential Oil of Almonds, 8 minims; Sodium Hypophosphites, 60 grains; Calcium Hypophosphites, 60 grains; Sherry, *q.s.* to produce 16 fl. oz. Dissolve the Hypophosphites in the Wine, place the Tragacanth in a dry mortar, rub with a little Oil, then add the yolks of Eggs (previously beaten), stir briskly, add Wine and Oil alternately until quantity is made up.—*A.Ph.F.*

Emulsio Olei Morrhuæ cum Hypophosphitibus.—Cod-Liver Oil, 50; Yolk of Egg, by volume, 6·50; Tragacanth, in powder, 0·25; Elixir of Gluside, 0·75; Simple Tincture of Benzoin, 0·75; Spirit of Chloroform, 3; Oil of Bitter Almonds, 0·10; Sodium Hypophosphite, 0·75; Calcium Hypophosphite, 0·75; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

It is sometimes made with Sherry instead of Distilled Water, and should then be distinguished as Emulsio Olei Morrhuæ cum Hypophosphitibus et Vino.

Foreign Pharmacopœias.—Span. (Emulsion de Aceite de Higado de Bacalao con Hipofosfitos), Oil of Bitter Almonds 0·25, Calcium Hypophosphites 5, Sodii Hypophosphites 5, Carrageen 10, Glycerin 120, Cod-Liver Oil 500, Water to 1000. Swiss (Emulsio Olei Jecoris), Cod-Liver Oil 1000, Gum Arabic 10, Tragacanth 10, White Gelatin 2, Calcium Hypophosphites 5, Sodii Hypophosphites 5, Sugar, 0·2; Cinnamon Oil 4 drops, Alcohol 50, Orange Water 40, Water 878. U.S. (Emulsio Olei Morrhuæ and Emulsum Olei Morrhuæ cum Hypophosphites), *see* above. Mex. (Emulsion de Aceite de Bacalao), Tragacanth 4, Glycerin 50, Cod-Liver Oil 250, Oil of Bitter Almonds 0·25, Calcium Hypophosphites 5, Sodium Hypophosphites 5, Water 200.

HUILE DE FOIE DE MORUE CRÉOSOTÉE.—Creosote, 1; Cod-Liver Oil, 99.—*Fr. Codex.*

HUILE DE FOIE DE MORUE PHOSPHORÉE.—Cod-Liver Oil, 497·5; Phosphorated Oil (1 p.c.), 2·5.—*Fr. Codex.*

MORRHUOL.—Cod-Liver Oil treated first with aqueous solution of Sodium Bicarbonate to remove the acids, then agitated with Alcohol (90 p.c.), which on evaporation yields Morrhuol. Brown Oil yields 4½ to 6 p.c., the straw coloured 2½ to 3 p.c.—*Y.B.P.* '86, 234; *P.J.* '97, ii. 458.

Proposed as a substitute for Cod-Liver Oil, but without the Carbo-hydrates, and, owing to its small bulk, is adapted for administration in capsules.

Dose.—3 grains = 0·2 gramme.

MOSCHUS.

MUSK.

FR., MUSC; GER., BISAM; ITAL., MUSCHIO; SPAN., ALMIZCLE.

The dried secretion from the preputial Follicles of *Moschus moschiferus*, L. Dark reddish-brown grains or masses of grains, somewhat unctuous to the touch, and possessing a peculiar penetrating persistent odour and a somewhat bitterish taste.

Dan., should be practically free from moisture, and yield not more than 8 p.c. of ash; *U.S.*, 8 p.c. of ash.

Commercial samples contain large quantities of moisture (about 30 p.c.).

The Musk-deer is a native of the mountainous regions of Central Asia. Musk is imported from China and India.

Medicinal Properties.—A diffusible stimulant and antispasmodic. Used in hysteria and spasmodic asthma, and as a stimulant in the prostration of diseases such as typhoid.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Prescribing Notes.—*Usually prescribed in a* **mixture** *or in* **pills.** *See formulas given below.*

Not Official.—Mistura Moschi, Moschus Exsiccatus, Pilula Moschi, and Tinctura Moschi.

Foreign Pharmacopœias.—Official in all except Austr., Belg., Dan., Ger. and Ital; Fr. (Musc); Port. (Almiscar); Mex. and Span. (Almizcle).

Descriptive Notes.—Musk enters commerce in two forms, viz., either in the original sacs or "pods," or in a granular powder known as Grain Musk, consisting of the dried contents of the sacs. The best kind is that known as Tonquin or China Musk; it occurs in oval, plano-convex sacs, covered on the convex side with long hairs, and has a small nearly central orifice around which bristly hairs converge. A pod contains on the average about 40 to 45 grammes of Grain Musk. It is imported *viâ* Canton. Yunnan Musk comes next in value, it comes *viâ* Shanghai; the sacs are more rounded and less oval, with crowded short hairs, and the orifice is usually stopped with a plug of rice straw. The Assam or Nepaul Musk occurs in sacs that have a rounder outline and a larger orifice, or are more spherical ('bally'), with the inner surface partly filled with a grisly substance and contains proportionately less grain than the other kinds. Cabardine, Russian or Siberian Musk, so called from the name Kabarga given to the animal in the Altai Mountains, is of a narrower oval form than the Tonquin Musk, more flattened, and the hairs are drier and the flat or ventral surface often has a white efflorescence. Its odour is weaker and slightly ammoniacal, and it is the least valuable kind. Musk is sometimes falsely packed, when stitches can be seen round the margin, especially if placed in lukewarm Water; or adulterated by the insertion of particles of lead, etc. If the hairs do not converge to the orifice the sac is of artificial character. The sacs are usually tested by probing with a long pin and the odour judged by the Musk attached to the pin when withdrawn, but it is necessary to use a fresh pin for each pod or the odour of a good pod or sac may be communicated to an adulterated one. The grains are officially stated to be 'contained in an oval sac 1½ to 2 in. (37 to 50 mm.) in diameter, nearly smooth on one side and covered on the outer side with hairs concentrically arranged around a nearly central orifice,' this description applying to Tonquin or China Musk pods. Artificial Musk that can be used as a perfume has recently been the subject of several patents.

Tests.—Musk is officially required to be free from impurities of an earthy nature, and should not leave more than 8 p.c. of ash when ignited with free access of air. Musk contains a considerable proportion of moisture, amounting to about 30 p.c.; the *U.S.P.* requires that the moisture should not exceed 15 p.c. and that the ash should not amount to more than 8 p.c. The moisture is determined by drying the Musk over Sulphuric Acid.

Not Official.

MISTURA MOSCHI.—Musk, 3; Gum Acacia, 3; Sugar, 3; Rose Water, 160; triturate the Musk with the Sugar, then with the Gum Acacia; add the Rose Water gradually.

Dose.—1 to 2 fl. oz. = 28·4 to 56·8 c.c.
An emulsion (1 in 100) is **Official** in Swed.

MOSCHUS EXSICCATUS.—Musk which has been dried over Strong Sulphuric Acid. It keeps better than that which is usually supplied as 'grain Musk.' It is easily made into pills with Dispensing Syrup or 'Diluted Glucose.'

PILULA MOSCHI.—Musk, 12; Powdered Gum Acacia, 3; Powdered Liquorice, 3.

Dried Musk, 12; Powdered Gum Acacia, 1; 'Diluted Glucose,' *q.s.*

TINCTURA MOSCHI.—Musk, 5; Alcohol (95 p.c.), 45; Water, 45; Alcohol (45 p.c.), *q.s.* to produce 100. Triturate the Musk with the Water a little at a time until a smooth mixture is obtained, transfer to a bottle, and allow it to stand for 24 hours; add the Alcohol and macerate the mixture for 6 days, occasionally shaking it, then filter through a plain paper filter and, when the liquid has drained off completely, pass enough Alcohol (45 p.c.) through the filter to make 100 of Tincture.—*U.S.P.*

This has been incorporated in the *B.P.C.* as follows:—

Musk, 5; Alcohol (90 p.c.), 50; Distilled Water, 45; Alcohol (45 p.c.), *q.s.* to produce 100.—*B.P.C.*

Fr., Mex. and Port.—Musk, 1; Spirit, 10.

Dutch, Russ. and Swiss.—Musk, 1; Spirit, 25; Water, 25.

Span.—Musk, 1; Spirit, 25.

U.S.—Musk, 5; Water, 45; Alcohol, 45; Diluted Alcohol to measure 100.

All by weight except U.S.

Not Official.

MYROBALANUM.

The dried immature Fruits of *Terminalia Chebula*, Retz., commonly known as *Chebulic myrobalans*. A local astringent.

Dose.—30 to 60 grains = 2 to 4 grammes.

UNGUENTUM MYROBALANI.—Myrobalans, in very fine powder, 1, Benzoated Lard,* 4.—*Ind.* and *Col. Add.*

UNGUENTUM MYROBALANI CUM OPIO.—Myrobalan Ointment, 92½; Opium, in powder, 7½.—*Ind.* and *Col. Add.*

MYRISTICA.

NUTMEG.

FR., MUSCADE DES MOLUQUES; GER., MUSKATNUSS; ITAL., NOCE MOSCATA; SPAN., NUEZ MOSCADA.

The dried Seed of *Myristica fragrans*, Houtt., divested of its testa.

It is cultivated in the Banda Islands of the Malayan Archipelago and imported from Sumatra and the Molucca Islands, and occasionally from the West Indies and the Seychelles.

Medicinal Properties.—Aromatic, stimulant, and carminative. Frequently used to cover the taste of Rhubarb and other medicines. The expressed and volatile Oils have been much used in chronic rheumatic pains and in lotions for the hair. In large and poisonous doses it resembles the action of Cannabis Indica.

Severe toxic symptoms followed on taking a whole nutmeg, grated, in a wineglassful of Gin, to procure abortion.—*L.* '02, i. 1035, 1798.

Paper on nutmeg poisoning by Cushny; he notes the scanty recognition of this in English medical literature, and narrates the death of a boy after eating two nutmegs.—*B.M.J.* '08, i. 387 and *L.* '08, i. 495.

Dose.—5 to 15 grains = 0·32 to 0·1 gramme.

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* Adeps Induratus (Lard deprived of a portion of its Oil by pressure) may be employed in India and the Colonies when prevailing high temperatures render it necessary. *See Appendix I. Ind.* and *Col. Add.*

Prescribing Notes.—*The* **Oil** *may be given on Sugar, or in* **pill** *with Liquorice powder and Soap, see p. 897.*

Official Preparation.—Oleum Myristicæ. Used in the preparation of Pulvis Catechu Compositus, Pulvis Cretæ Aromaticus, Spiritus Armoraciæ Compositus and Tinctura Lavandulæ Composita; of the **Oil,** Spiritus Myristicæ. Used in the preparation of Spiritus Ammoniæ Aromaticus, Tinctura Guaiaci Ammoniata, Tinctura Valerianæ Ammoniata and Pilula Aloes Socotrinæ. Of the **Spirit,** contained in Mistura Ferri Composita.

Not Official.—Oleum Myristicæ Expressum (Myristicæ Adeps).

Foreign Pharmacopœias.—Official in Austr., Dutch, Ger., Russ., Swed. and Swiss (Semen Myristicæ); Belg. and Hung. (Nux Moschata); Fr. (Muscade des Moluques); Ital. (Noce Moscata); Port. (Noz Moschada); Mex. and Span. (Nuez Moscada); U.S. (Myristica). Not in Dan., Jap. or Norw.

Descriptive Notes.—Nutmegs, freed from the endocarp or shell, are imported into this country from Penang, Singapore, Bombay, and the West Indies. The Dutch formerly treated the Nutmegs with Milk of Lime with the view of preventing germination and so securing a monopoly, but avowedly to protect them from the attack of insects; but exposure to the sun for a week effectually prevents germination. The Chinese prefer to import them in the shell, dried till they rattle inside, in spite of the increase of cost of freight; the aroma of the seed is best preserved in this manner. Nutmegs are sorted according to size, and may vary from 66 to 132 to the lb., those from 66 to 84 being of good size and fetching, if in good condition, the highest price. The smaller and defective or irregularly formed Nutmegs are used for distilling the Oil, and for expressing the fixed Oil known as Nutmeg Butter, and erroneously as Oil of Mace; Nutmeg Butter is also imported from Singapore. Nutmegs are obtusely oval or rounded, and vary very much in size, those of good quality are 1 to 1¼ in. long (25 to 31 mm.) and ⅞ in. (22 mm.) broad (rarely exceed 1 in. (25 mm.) in length, *B.P.*). The surface is furrowed and veined, with a circular scar at the broad end; the transverse section shows ruminated Albumen caused by the infolding layer of the light brown perisperm; it is easily cut, and has a waxy lustre, a characteristic odour, and a slightly bitter, aromatic taste. The microscopical characters of Nutmegs are the dark brown tabular cells of the perisperm and the polyhedric cells of the endosperm, some containing starch grains with a central hilum, often in groups of 4 to 8, others a large rhombic crystalloid, and others filled with brown oleoresinous colouring matter. Malabar Nutmegs (*Myristica Malabarica*, Lam.) which are sometimes offered for sale have practically no aroma. Macassar Nutmegs (*Myristica argentea*, Warb.) imported from New Guinea *viâ* Macassar have a faint Nutmeg flavour, but are much more acrid. Both of these are longer than true Nutmegs, exceeding an inch and a half as a rule.

Mace, the arillus of Nutmegs, is sold separately. When fresh it is of a bright crimson red colour, but fades to bright orange brown. The distinctive microscopical characters of true Mace are the polymorphous grains of amylodextrin in the parenchymatous cells, which are coloured brownish red by solution of Iodine in Iodide of Potassium, and the large elongated thick-walled quadrangular, epidermal cells, often with pointed ends. Powdered Mace is frequently adulterated with Bombay Mace; the latter can be detected by the rounded cells containing a dark yellow colouring matter, often free, and by the red flocculent precipitate given in an alcoholic extract of the Mace by the solution of Lead Acetate; if the Mace is genuine, only a milky-white turbidity is produced. Turmeric, which is not likely to be used, gives a similar precipitate, but filtering paper dipped in the alcoholic solution and dried gives with Boric Acid an orange red or red brown colour, which Bombay Mace does not. Bombay Mace also contains a fat which has different chemical characters from that of the true Mace. *Myristica fatua*, Houtt., and *M. cinnamomea*, King, appear to be the only species resembling in flavour the true Nutmeg.

Tests.—Nutmeg when incinerated with free access of air yields from 2 to 3 p.c. of ash, and the figure should not exceed 4 p.c. It yields from 9 to 15 p.c. of volatile Oil, which should answer the tests given under Oleum Myristicæ; it also contains from 30 to 40 p.c. of fixed Oil.

Preparations.

OLEUM MYRISTICÆ. Oil of Nutmeg.

A colourless, or pale yellow, mobile liquid, possessing a characteristic odour and a spicy taste; distilled from Nutmeg.

It darkens in colour and becomes viscid by oxidation on exposure to air. It should therefore be kept in well-closed glass bottles of a dark amber tint and protected as far as possible from exposure to the air and light.

Solubility.—In all proportions of Absolute Alcohol; 1 in $4\frac{1}{2}$ of Alcohol (90 p.c.); sparingly in Alcohol (60 p.c.).

Dose.—$\frac{1}{2}$ to 3 minims = 0·03 to 0·18 c.c.

Foreign Pharmacopœias.—Official in Austr., Dutch, Ger., Hung., Russ. and Swiss (Oleum Macidis); Belg. (Essentia Myristica); Jap. (Oleum Myristicæ Ætherum); Norw. and Swed., (Ætheroleum Macidis); Port. (Essencia de Noz Moschada); U.S. (Oleum Myristicæ).

Tests.—The Oil of Nutmeg has a sp. gr. of 0·865 to 0·930. The official figures are 0·870 to 0·910; the *U.S.P.* 0·884 to 0·924 at 25° C. (77° F.); the *P.G.* 0·890 to 0·930. It is officially required to form a clear solution with its own volume of a mixture of equal parts of Absolute Alcohol and Alcohol (90 p.c.); the *U.S.P.* states that it is soluble in an equal volume of Alcohol (94·9 p.c.) and also soluble in 3 volumes of Alcohol (90 p.c.); the *P.G.* states that it dissolves in 3 parts of Alcohol (90 p.c.). The Oil is optically dextrogyrate, the rotation being from +7° 52′ to +28 in a 100 mm. tube. The *B.P.* requires that the Oil when evaporated on a water-bath shall not leave a residue which crystallises on cooling, which indicates the absence of concrete Oil of Nutmeg. The *U.S.P.* states that when 2 or 3 c.c. of Oil are evaporated on a water-bath no residue which crystallises on cooling should be left. The Pharmacopœia test for concrete Oil of Nutmeg has been somewhat adversely criticised;

attention is drawn (*P.J.* '01, i. 328) to the necessity for modification of the pharmacopœial description. The requirement that the Oil should yield, when evaporated on a water-bath, no residue which crystallises on cooling, necessitates the attachment of some qualifying phrase, such as 'by fractionation,' and the Pharmacopœia description as the 'Oil distilled from Nutmeg,' otherwise the tests given in the *B.P.* would seem to require modification.

The presence of fixed or fatty Oil which is carried over mechanically during distillation is supposed to cause an unpleasant preponderance of the Nutmeg over the lemon flavour in Sal Volatile.

The Oil contains Dextro- and Lævo-Pinene, Dipentine, Myristicol, Myristicin, Myristinic Acid, and a Phenol-like substance which yields an emerald green with Ferric Chloride T.S.

SPIRITUS MYRISTICÆ. SPIRIT OF NUTMEG.

Oil of Nutmeg, 1; Alcohol (90 p.c.), *q.s.* to produce 10.

Should be clarified if necessary, by means of Talc.
B.P. 1885 was 1 in 50.

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

Tests.—Spirit of Nutmeg has a sp. gr. of about 0·833; it contains about 0·5 p.c. w/v of total solids, and about 86·0 p.c. w/v of Absolute Alcohol.

Not Official.

OLEUM MYRISTICÆ EXPRESSUM. *Syn.* MYRISTICÆ ADEPS.—A concrete Oil, of a firm consistence and orange colour, obtained from Nutmeg by expression and heat.

Foreign Pharmacopœias.—Official in Austr. (Ol. Myristicæ Expressum); Dutch and Swiss (Oleum Myristicæ); Fr. (Beurre de Muscade); Ger. (Ol. Nucistæ); Mex. (Manteca 'O Aceite concreto de Nuez Moscada); Port. (Oleo de Noz Moschada). Not in the others.

MYRRHA.

MYRRH.

FR., MYRRHE; GER., MYRRHE; ITAL., MIRRA; SPAN., MIRRA.

Small, irregular, brownish-yellow, or reddish-brown, rounded fragments, or tears, or masses of them, having a dusty appearance on the surface, and possessing a strong characteristic aromatic odour. It is a Gum Resin obtained from the Stem of *Balsamodendron Myrrha*, and probably other species.

Collected in Somaliland and South-eastern Arabia.

Myrrh contains from 57 to 59 p.c. of Gum, a neutral Resin, a soft Resin and two acid Resins, and from 7 to 8 p.c. of an ethereal Oil.

Solubility.—Myrrh contains from 40 to 65 p.c. of Gum soluble in Water; the remainder, consisting of Resin, is mostly soluble in Alcohol.

Medicinal Properties.—Stomachic and carminative; expectorant. Locally to aphthæ of mouth and spongy gums.

Prescribing Notes.—*The Tincture mixed with Water* (1 *to* 24) *is used as a gargle, but the addition of Mucilage of Gum Acacia is often necessary; also mixed with Solution of Borax as a mouth-wash.*

Official Preparation.—Tinctura Myrrhæ. Contained in Decoctum Aloes Compositum, Mistura Ferri Composita, Pilula Aloes et Myrrhæ, Pilula Galbani Composita, and Pilula Rhei Composita.

Not Official.—Gargarisma Myrrhæ (*Squire*).

Foreign Pharmacopœias.—Official in all except Hung.

Descriptive Notes.—Myrrh as imported is usually mixed with the Gum Resins of allied species of *Balsamodendron*, which need to be removed. None of these have the strong bitterness of Myrrh, but most of them are acrid. Bissabol, the product of *Balsamodendron Erythrœum*, var. *glabrescens*, Engl., has a distinct odour and taste, but much resembles Myrrh in colour and in the presence of white streaks of gum. It does not give the violet colour with the official test for Myrrh (*P.J.* (4) xiii. 666–7). It is known in commerce as 'Opopanax,' and is the source of the 'Oil of Opopanax' used in perfumery. True Opopanax Oil has a strong flavour of Celery or Lovage, and is the product of an umbelliferous Gum Resin imported from Persia. Indian and African Bdelliums are acrid, but have neither the taste nor odour of Myrrh, and have not white streaks of gum; the former has a taste like cedar; they have a dull fracture and are tougher and less easily broken than Myrrh.

Pure Myrrh is characterised by its distinctive odour and flavour and its bitter taste, and by assuming a violet colour when moistened with Nitric Acid, which the false Myrrhs do not present when so treated. It varies much in size and form, but is usually reddish-brown externally, with a powdery surface, and when broken either presents a dull uniform resinous fracture, often somewhat translucent, or in other pieces there occur distinct white streaks, indicating gum. Crude or unpicked Myrrh should not be used in pharmacy, as it contains so much foreign matter that its price is only one-third of that of selected Myrrh. Pieces in which coiled drops of thickened oil have exuded on the surface will be richer in aroma and contain more oil. Pieces containing white streaks are more suitable for emulsion, and those with little gum are preferable for tincture, the gum being insoluble in Alcohol. The gum left after making the tincture makes a good adhesive mucilage when dissolved in water.

Tests.—Myrrh is officially required to yield a violet colour when moistened with Nitric Acid. This test has been modified (*P.J.* '01, ii. 666) to 0·5 of a gramme of coarsely powdered Myrrh mixed with 10 c.c. of Ether and shaken occasionally for 10 minutes yields a filtrate, 2 c.c. of which should yield on evaporation a residue which is coloured violet with the vapour of Nitric Acid. No percentage of matter soluble or insoluble in Alcohol (90 p.c.) is given nor is any reference made to the percentage of ash. The *U.S.P.* states that in Alcohol (94·9 p.c.) it yields a brownish-yellow tincture, acquiring a purplish-red tint on the addition of Nitric Acid, but no percentage of matter soluble or insoluble in Alcohol is recorded. The German Pharmacopœia requires that when 1 gramme of powdered Myrrh is shaken with 2 or 3 grammes of Ether, the liquid filtered and the yellow filtrate treated with Bromine vapour, a reddish-violet coloration is produced. This Bromine reaction is usually considered to be unreliable. A test which is stated to distinguish between Heerabol and Bissabol Myrrh is as follows: Mix 6 drops of a 1 in 15 Petroleum Ether extract of the Myrrh with 3 c.c. of Glacial Acetic Acid, and float the mixture carefully on the surface of 3 c.c. of Sulphuric Acid, a rose-red coloration forms at the point of contact of the two liquids.

100 parts of Myrrh when completely exhausted with boiling Alcohol (90 p.c.) are required by the *P.G.* to leave a residue which upon drying shall not yield more than 70 parts; the percentage of ash shall not amount to more than 6 p.c. Myrrh is stated (*C.D.* '00, i. 101) to be easily obtainable of good quality, it should leave when exhausted by Alcohol (90 p.c.) not more than 60 p.c. of insoluble residue, and the ash should not exceed 5 p.c. and should be almost entirely soluble in dilute Hydrochloric Acid.

Dieterich suggests a limit of not more than 70 p.c. of matter insoluble in Alcohol and that the percentage of ash should not be more than 10 p.c., and also suggests the inclusion of figures for the Acid, Ester and Saponification values of the Gum Resin, and gives for Heerabol Myrrh containing 20 p.c. of matter soluble in Alcohol an Acid value of 25·48, an Ester value of 204·12, and a Saponification value of 229·60.

A sample of Gum Myrrh Elect examined in the author's laboratory gave 49·94 p.c. of matter insoluble in Alcohol (90 p.c.); 3·75 p.c. of ash. It contained 50·06 p.c. of matter soluble in Alcohol (90 p.c.) and possessed an Acid value of 19·6, an Ester value of 118·44 p.c. and a Saponification value of 138·04 p.c. Other samples of the Gum Resin examined for percentage of ash only gave from 3·3 to 4·6 p.c. Samples of powdered Myrrh gave from 4·7 to 6·2 p.c. of ash. Two samples of the powder gave 45·92 and 45·69 for the Acid value, 86·24 and 91·51 for the Ester value, and 132·16 and 137·20 for the Saponification value. They contained respectively 6·2 p.c. and 6·05 p.c. of ash. They were unfortunately not examined for the percentage of matter soluble in Alcohol (90 p.c.). A sample of powder yielded 4·5 p.c. of ash and yielded 56·90 p.c. of matter soluble in Alcohol (90 p.c.).

Preparation.

TINCTURA MYRRHÆ. TINCTURE OF MYRRH.
Myrrh, 1; Alcohol (90 p.c.), *q.s.* to yield 5. (1 in 5)

B.P. 1885 was 1 in 8.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Ger., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S., 1 in 5. All by weight except U.S. Not in Fr. or Hung.

Tests.—Tincture of Myrrh has a sp. gr. of 0·845 to 0·855; it contains from 4 to 6 p.c. w/v of total solids, averaging about 5 p.c. w/v, but this figure must necessarily depend upon the amount of matter soluble in Alcohol (90 p.c.) contained in the Gum Resin used; it also contains about 85 p.c. w/v of Absolute Alcohol. A few drops of the Tincture evaporated on a water-bath yield a residue giving a violet coloration when moistened with Nitric Acid.

Not Official.

GARGARISMA MYRRHÆ (*Squire*).—Tincture of Myrrh, 1; Honey, 1; Infusion of Roses, 18.

This has appeared in *Squire's Companion* since 1864 and is now incorporated in the *B.P.C.*

TINCTURE OF MYRRH AND BORAX.—*See* BORAX.

Not Official.

NAPHTHALINUM.

NAPHTHALENE.

$C_{10}H_8$, eq. 127·10.

Crude Naphthalene is a hydrocarbon, crystallising from coal-tar. When purified by sublimation it occurs in white micaceous scales, with a characteristic odour, melting at 80° C. (176° F.).

Solubility.—Insoluble in Water; soluble 1 in 25 of Alcohol (90 p.c.); 1 in 1½ of Chloroform; 1 in 3 of Ether; 1 in 7½ of Oil of Turpentine; 1 in 8 of Olive Oil; slightly soluble in Glycerin.

Medicinal Properties.—Antiseptic; the fine powder is dusted over ulcers and wounds, and is useful for disinfecting cavities. It is given as an intestinal disinfectant. A parasiticide in scabies, as 10 p.c. solution in Olive Oil, or as an Ointment.

Crude Naphthalene in balls and other shapes is used to protect furs and woollen articles from moths.

Dose.—Usual dose, 2 to 5 grains = 0·13 to 0·32 gramme, every four or six hours. Larger doses have been given, but are apt to upset digestion, and in some cases to produce toxic symptoms.

Prescribing Notes.—*It has a nauseous taste and odour; when given internally it may be enclosed in a cachet or capsule; or made into pills with* 1 *of Compound Tragacanth Powder to* 12, *and massed with* '*Diluted Glucose.*'

Foreign Pharmacopœias.—Official in Austr., Dutch, Ger., Ital., Jap., Mex., Russ., Swed., Swiss and U.S. Not in the others.

Tests.—Naphthalene melts at 80° C. (176° F.) and boils at 218° C. (424·4° F.), it volatilises slowly at the ordinary temperature and completely with further heat, it burns with a luminous smoky flame. It should not possess an acid reaction to blue Litmus paper moistened with Water, indicating the absence of free acids, *e.g.*, Sulphuric Acid. It should dissolve colourless in warm concentrated Sulphuric Acid if quite pure, but a decided pinkish tint is observed if the sample contains 1 p.c. of impurity, the coloration becoming a deeper pink or even brown the larger the proportion of foreign matter present. 0·5 of a gramme when ignited with free access of air should leave no weighable residue, indicating the absence of mineral impurity.

NAPHTHALINUM PRÆCIPITATUM.—A fine powder, obtained by dissolving the crystals in hot Alcohol, and pouring into a quantity of cold Water, Recommended as less irritating than the powdered crystals.

PULVIS NAPHTHALINI (*Rossbach*).—Purified Naphthalene, 75 grains; Sugar, 75 grains; Oil of Bergamot, ½ minim; divide into 20 powders. In vesical catarrh.—*L.* '85, i., 360.

NAFTALAN.—A dark, greenish-black, unctuous substance, insoluble in Water, soluble in Ether and in Chloroform; an extraction product of a naphtha from the Caucasus containing about 96 p.c. Soap. Used in various skin diseases, and stated to be a good vehicle for the application of antiseptic preparations.—*L.* '99, i. 1234; *B.M.J.E.* '99, i. 92; *P.J.* '01, ii. 124; *B.M.J.E.* '05, i. 40. It may be applied (*B.M.J.E.* '05, ii. 64) as an ointment or in the form of suppositories.

Naphthalini Tetrachloridum.—Glistening, white crystals, insoluble in Water.

Dose.—2 to 10 grains = 0·13 to 0·65 gramme.

NAPHTHOL.

BETA-NAPHTHOL.

BETA-MONO-HYDROXY-NAPHTHALENE.

$C_{10}H_8O$, eq. 142·98.

FR., NAPHTHOL; GER., BETANAPHTHOL; ITAL., NAFTALOLO.

White, or pale yellowish, lustrous, crystalline laminæ or as a white or almost white crystalline powder, having a faint odour suggestive of Phenol, and a sharp, biting but not persistent taste.

It is described in the *U.S.P.* as a monatomic Alcohol, occurring in coal-tar, but usually prepared from Naphthalene; the *B.P.* states that it is derived from Naphthalene-sulphonic Acid.

It should be kept in well-closed bottles of a dark amber tint and protected as far as possible from the air.

There are two isomeric Naphthols, **Alpha-Naphthol** and **Beta-Naphthol,** bearing the same relation to Naphthalene as Phenol does to Benzol.

Solubility.—Nearly insoluble in Water; soluble 1 in 2 of Alcohol (90 p.c.); 3 in 4 of Ether; 1 in 24 of Chloroform; 1 in 12 of Olive Oil; 1 in 40 of Glycerin.

Aqueous solution of Boric Acid will dissolve comparatively small quantities of Naphthol.

Medicinal Properties.—Disinfectant; intestinal antiseptic. Given in summer diarrhœa of children, and in typhoid and intestinal dyspepsia; prolonged administration, especially of large doses, may lead to nephritis. Used in parasitic skin diseases and in chronic eczema in form of ointment.

Dose.—3 to 10 grains = 0·2 to 0·65 gramme.

Prescribing Notes.—*Given in* **cachets** *or* **pills**. *A good pill can be made by adding a small quantity of Compound Powder of Tragacanth and Dispensing Syrup, or 'Diluted Glucose,' q.s. Also administered dissolved in Oil, which is then emulsified. It can be made into an Ointment with Lard, Soft Paraffin or Lanolin Ointment; for Kaposi's Ointments, see below.*

When no prefix is attached to the name, Beta-Naphthol should be used. The name is also written Napthol.

Should be kept in dark amber-tinted well-stoppered bottles.

Not Official.—Lassar's Itch Remedy, Naphthol-Camphor, Pommade Naphtholée, Parogenum Naphtholis, Unguentum Naphtholi, Unguentum Naphtholi Compositum, Vasolimentum Naphtholi, Asaprol, Benzonaphthol, Betol, Epicarin, Quinaphthol.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Russ., Span., Swed., Swiss and U.S.

Tests.—Beta-Naphthol when pure melts at 122° C. (251·6° F.) and boils at 286° C. (546·8° F.); the *B.P.* gives the above m.p. but not the boiling point; the *U.S.P.* and *P.G.* give the above-mentioned m.p. and boiling point.

A hot saturated aqueous solution yields a blue fluorescence with one drop of Ammonia Solution; if some Chlorine Solution be added to a cold saturated aqueous solution a white turbidity is produced, and on the addition of Ammonia Solution a green or brownish coloration is produced. In performing this test the *U.S.P.* uses in the place of Chlorine Water a solution of Chlorinated Lime and requires that it should produce a yellow colour. The *B.P.* requires that 10 c.c. of a 1 p.c. boiling aqueous solution should yield a white precipitate becoming brown upon the addition of 10 drops of 3 p.c. aqueous Ferric Chloride Solution. A saturated aqueous solution yields no colour upon the addition of a few drops of Iodine T.S. followed by an excess of Sodium Hydroxide Solution. It is distinguished from its isomer Alpha-Naphthol by the m.p., Alpha-Naphthol melting at 95° C. (203° F.); by the reaction with Chlorinated Lime Solution, Alpha-Naphthol giving a dark violet colour; by the test with Ferric Chloride Solution, Alpha-Naphthol giving a violet coloration with the latter reagent; and by the test with Iodine Solution and excess of Sodium Hydroxide Solution, which produces an intense violet coloration with Alpha-Naphthol.

The more generally occurring impurities are free acid, Naphthalene, organic impurities, and impurities of a mineral or inorganic nature. It should possess a neutral reaction towards Litmus paper previously moistened with Alcohol (90 p.c.). Naphthalene and organic impurities may be detected by the Ammonia test given in small type below. 0·5 of a gramme when ignited with free access of air should leave no weighable residue.

Residue.—When heated it readily sublimes, and is volatilised from its aqueous or alcoholic solution with the vapour of Water or Alcohol, *U.S.P.* It should leave no residue on ignition, *B.P.* and *U.S.P.* 0·2 gramme should not leave a weighable residue after ignition, *P.G.*

Ammonia.—Beta-Naphthol should be soluble in 50 parts of Ammonia Water without residue, and the solution should not have a deeper colour than pale yellow, *U.S.P.* and *P.G.*

Chlorinated Lime.—A cold saturated aqueous solution should not show a violet colour with solution of Chlorinated Lime, *P.G.* and *U.S.P.*, the latter stating that the colour should be pale yellow on the addition of Chlorinated Lime to an aqueous solution.

Not Official.

UNGUENTUM NAPHTHOLI (Kaposi's Ointment).—Beta-Naphthol, 60 grains; Prepared Lard, 1 oz.
Beta-Naphthol, 10; Lard, 90.—*B.P.C.*

POMMADE NAPHTHOLÉE.—Beta-Naphthol, 10; Vaseline, 90.—*Fr.*

UNGUENTUM NAPHTHOLI COMPOSITUM (Kaposi).—Naphthol, 15; Prepared Chalk, 10; Soft Soap, 50; Lard, 100.

Official in Austr., β-Naphthol, 10; Precipitated Chalk, 5; Soft Soap, 28; Lard, 57.

LASSAR'S ITCH REMEDY.—Beta-Naphthol, 0·25; Peru Balsam, 10; Spirit Soap, 25.—*Hager.*

VASOLIMENTUM NAPHTHOLI. — Beta-Naphthol, 10; Vasoliment Liquid, 90.—*Hager.*

Parogenum Naphtholis. *Syn.* Naphthol Vasoliment.—Naphthol, 10; Parogen, *q.s.* to produce 100.—*B.P.C.*

ASAPROL. ABRASTOL (Calcium Beta-naphthol-alpha-monosulphonate).—A white powder, soluble in Water. Has been recommended as an antipyretic and analgesic, in sciatica, muscular and chronic rheumatism and in chronic nephritis.—*T.G.* '93, 182; '94, 252; *Pr.* liii. 52; *M.A.* '95, 8; *Y.B.T.* '94, 462; '95, 159.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

BENZONAPHTHOL. $C_{10}H_7C_6H_5CO_2$, eq. 246·23. It may be prepared by the action of Benzoyl Chloride on Beta-Naphthol. A white, odourless, tasteless powder, almost insoluble in Water and Ether; soluble in Chloroform.

Intestinal antiseptic, and disinfectant. Has been found useful in typhoid.—*Pr.* li. 213. In tropical dysentery.—*L.* '95, ii. 169; *P.J.* '95, ii. 238.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Official in Fr., Mex., Span. and Swiss.

Tests.—Benzonaphthol melts at 107° to 108° C. (224·6° to 226·4° F.), the *Fr. Codex* (1908) gives 110° C. (230° F.), it dissolves in Sulphuric Acid with the production of a pale yellow colour; if the Sulphuric Acid solution be diluted with Water and rendered alkaline with an excess of Ammonia Solution, a green fluorescence is produced. When warmed with Potassium Hydroxide Solution it is decomposed; if the solution be exactly neutralised with diluted Sulphuric Acid, it yields with Ferric Chloride T.S. a buff coloured precipitate. The Benzoic Acid separated from the salt should possess the m.p. and answer the tests given under Acidum Benzoicum. A small quantity warmed with Potassium Hydroxide Solution, cooled, rendered faintly acid by the addition of diluted Sulphuric Acid yields on the addition of Chlorinated Lime Solution a yellow colour but no dark violet coloration.

BETOL. NAPHTHALOL β-Naphthol Salicylic Ester. Beta-Naphthol Salicylate, β-Naphthol Salicylic Acid Ester. $C_{10}H_7 \cdot C_7H_5O_3$, eq. 262·11.—In tasteless, small white crystals, or as a white, odourless, tasteless and crystalline powder; insoluble in Water, soluble in Alcohol and in fixed Oils. Recommended in rheumatism, cystitis and intestinal fermentation.

It may be prepared by the action of Phosphorus Oxychloride on a mixture of Sodium Beta-Naphthol and Sodium Salicylate.

Dose.—2 to 8 grains = 0·13 to 0·52 gramme as a **powder,** or in **pills** with Glucose.

Official in Fr. (Salicylate de Naphtyle-β) and Ital.

In **pencils** for gonorrhœa containing 20 p.c. of Betol with Oil of Theobroma.

Tests.—Beta-Naphthol Salicylate melts at 95° C. (203° F.), which figure is also given in *Fr. Codex* (1908), when shaken with Water and filtered, the filtrate should be neutral in reaction towards Litmus paper. When treated with Sulphuric Acid it yields a yellow coloration and in the course of a few minutes a lemon-yellow coloured solution, which on the addition of a drop of Nitric Acid changes to a brownish-green. A 1 p.c. solution of the salt in Alcohol (90 p.c.) yields with 1 drop of a strongly diluted Ferric Chloride Solution a violet coloration, but the highly diluted Ferric Chloride Solution is only rendered turbid, and no coloration is produced, when 10 to 20 drops of a 1 p.c. solution of the salt in Alcohol (90 p.c.) is added to it. When heated with Potassium Hydroxide Solution it is decomposed, forming Potassium Beta-Naphthol and Potassium Salicylate. If the solution be carefully neutralised with Hydrochloric Acid it yields on the addition of Ferric Chloride T.S. a violet coloration, the salt is also decomposed by concentrated acids yielding Salicylic Acid and Beta-Naphthol; the separated Salicylic Acid should possess the m.p. and answer the tests given under Acidum Salicylicum. When heated with Potassium Hydroxide Solution, cooled and slightly acidified with diluted Sulphuric Acid it yields on the addition of Chlorinated Lime a yellow but not a dark violet coloration. 0·5 of a gramme of the salt when ignited with free access of air should leave no weighable residue.

Alphol is the Salicylate of α-Naphthol Ester.

EPICARIN (Beta-oxynaphthyl-orthoxy-meta-toluylic Acid).—Colourless needle-shaped crystals, or a pale yellow powder, insoluble in Water, soluble in Alcohol and Ether. Employed in the form of a 10 to 20 p.c. Ointment in psoriasis, eczema and other skin affections, and in the form of a 5 to 10 p.c. alcoholic solution for seborrhœa capitis and lichen planus.—*Y.B.P.* '02, 177.

The Sodium salt of the above is also known commercially.

Tests.—Epicarin melts at 199° C. (390·2° F.), it dissolves readily in Alcohol (90 p.c.), yielding a solution which gives on the addition of Ferric Chloride T.S. a deep blue colour; it yields when treated with concentrated Sulphuric Acid a reddish-brown solution possessing a strong green fluorescence; when mixed with Potassium Hydroxide Solution and shaken with Chloroform a yellowish turbidity is produced subsequently changing to a yellowish-green. When heated with free access of air it should leave no weighable residue.

NAPHTHOL-CAMPHOR.—Mix 2 of Camphor with 1 of Beta-Naphthol to a viscous consistency, insoluble in Water, soluble in Oils; it is strongly antiseptic.—*Hager.*

A difference of opinion appears to exist as to the harmlessness of this preparation for the treatment of certain localised tuberculous lesions. On the one hand, no grave sequels were shown to have followed 10,000 injections; and on the other, 12 deaths are reported after its use.—*L.* '04, ii. 1893; *P.J.* '05, i. 177.

QUINAPHTHOL (Quinine Beta-naphthol-sulphonate).—A yellow crystalline powder, sparingly soluble in Water and in Alcohol.

Intestinal antiseptic. Useful in typhoid.—*P.J.* '87, ii. 83.

Dose.—8 to 10 grains = 0·52 to 0·65 gramme, three or four times a day.

Tests.—Quinaphthol fuses at 185° C. (365° F.), when ignited with free access of air it leaves no weighable residue.

Sodium-Naphthol (Microcidin) readily soluble in Water, **Hydronaphthol, Lactonaphthol (Lactol),** and **Naphthol-Camphor** have also been introduced as possessing properties similar to those of Naphthol; **A-Oxynaphthoic Acid** forms soluble salts with alkalis, which are antiseptics.

Not Official.

NICKEL.

A metal closely allied to Cobalt, with which it is generally associated in minerals. Commercially it is largely contaminated with Copper, Iron, and sometimes Cobalt. Alloyed with Copper and Zinc, it forms **German Silver.** Easily soluble in mineral acids, forming salts of a characteristic green colour.

NICCOLI BROMIDUM.—Green, hygroscopic crystals, soluble in Water, Alcohol, and Ether.

Sedative. Recommended in epilepsy.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

In solution, or in pills.

SYRUPUS NICCOLI BROMIDI.—Granulated Nickel, 137 grains; Bromine, 377 grains; Water, 12 fl. oz.; digest them in a pint flask at a gentle heat until reaction ceases, filter, add Sugar, 24 oz., and sufficient Water to make 32 fl. oz.

Each fl. drm. contains 5 grains of Nickel Bromide, which is an average dose. —*A.J.P.* '86, 592.

NICCOLI SULPHAS.—Greenish-blue crystals, readily soluble in Water.

Dose.—$\frac{1}{2}$ to 1 grain two or three times a day in chlorosis; is best given on a full stomach, as otherwise it is apt to produce nausea. In somewhat larger doses it has also been given in locomotor ataxy.

The toxicology of **Nickel Carbonyl.**—*B.M.J.* '07, ii. 687.

Not Official.

NITROGLYCERIN.

Syn.—GLYCERYL TRINITRATE; GLONOIN; TRINITRIN; TRINITRO-GLYCERIN.

$C_3H_5\,(NO_3)_3$, eq. 225·47.

When pure it is a heavy, colourless, oily liquid. Explodes violently on percussion, and under some circumstances spontaneously.

A **10 p.c. solution** in Alcohol is commercial, and is used in making the Tabellæ.

Solubility.—Very slightly soluble in Water; readily in Alcohol (90 p.c.); mixes with Ether and with Chloroform.

Medicinal Properties.—Chiefly given for angina pectoris associated with aortic disease, spasmodic asthma and the dyspnœa of acute bronchitis; in hæmoptysis and in headache, neuralgia or hemicrania if associated with pallor. It reduces arterial tension in chronic Bright's disease and acts as a diuretic and diminishes the albuminuria. Chemically, it is a nitrate, but its physiological action resembles the Nitrites. It is similar to that of Amyl Nitrite, but its action is slower and more prolonged.

Of service in migraine, especially when combined with Strychnine, but not for the attack itself; its service is obtained by continuous administration between the attacks (Gowers).—*B.M.J.* '06, ii. 1622.

Preferred to Amyl Nitrite by some in hæmoptysis, because of its more lasting effect.—*L.* '08, i. 565.

For hæmoptysis give two tabellæ in the 24 hours, breaking them up into small pieces, and letting the patient take a piece every hour.—*Pr.* '07, l. 335.

In optic atrophy, *M.A.* '95, 261; in neuralgia and sciatica, in uræmic dyspnœa, in all forms of vomiting.—*M.P.* liv. 515; *M.A.* '95, 37, 445, 497, 520; *Pr.* li. 140; in arterio-sclerosis, *T.G.* '93, 736; in warding off, and (hypodermically) during paroxysm of epilepsy, *B.M.J.E.* '93, ii. 32; in gall-stone colic, *L.* '96, i. 353.

Dose.—$\frac{1}{200}$ to $\frac{1}{50}$ grain = 0·0003 to 0·0013 gramme, the average dose being $\frac{1}{100}$ grain = 0·0006 gramme.

Prescribing Notes.—*The Solution may be given on Sugar, or in the form of Tablets, or diluted with Water.*

Official Preparations.—Liquor Trinitrini and Tabellæ Trinitrini.

Not Official.—Haustus Trinitrini, and Tabella Nitroglycerini Composita.

Antidotes.—Ergot, Atropine, Strychnine, cold applications to the head.

Foreign Pharmacopœias.—Official in Jap., Mex. and Span.

Tests.—Nitroglycerin has a sp. gr. of 1·6 and, when pure, is colourless, but the commercial product generally has a yellow colour. It solidifies at 8° C. (46·4° F.), and is then very dangerous to handle. When smartly struck or compressed, or when dropped on an iron plate heated to 257° C. (494·6° F.), it explodes with great violence. It is decomposed by Alcoholic Potassium Hydroxide Solution, yielding a mixture of Potassium Nitrate and Nitrite, Potassium Acetate and Formate. When treated with a solution of Ferrous Sulphate acidified with Hydrochloric Acid, gives the brown coloration characteristic of Nitrites and Nitrates.

Official Preparations.

LIQUOR TRINITRINI. SOLUTION OF TRINITRIN. *B.P.Syn.*—SOLUTION OF NITROGLYCERIN.

Trinitroglycerin of commerce, 17½ grains; Alcohol (90 p.c.), *q.s.* to yield 4 fl. oz.

1 minim contains $\frac{1}{110}$ of a grain.

Dose.—½ to 2 minims = 0·03 to 0·12 c.c.

In severe cases of angina pectoris or asthma, the dose is sometimes increased.

Foreign Pharmacopœias.—Official in Dutch (Solutio Nitroglycerini), Dan., Jap., Mex. and Span, 1 in 100; U.S. (Spiritus Glycerylis Nitratis), 1 in 100. Not in the others.

Tests.—Solution of Nitroglycerin has a sp. gr. 0·830 to 0·836. The official gravity is 0·840. It is a clear, colourless liquid, possessing a neutral reaction towards Litmus paper. The presence of a due amount of Nitroglycerin is officially ensured by a test of which the following are the essential details:—A measured quantity of 10 c.c. of the solution when mixed with 10 c.c. of Water yields a clear solution when cooled to 15·5° C. (60° F.), but a turbidity is produced in the mixture upon the further addition of 1 c.c. of Water, the Nitroglycerin separating out as an oily liquid when the mixture is still more largely diluted. If only 1 drop of this oily liquid be placed upon bibulous paper and sharply struck with a hammer a violent explosion results.

TABELLÆ TRINITRINI. TRINITRIN TABLETS. *B.P.Syn.*—TABLETS OF NITROGLYCERIN.

These tablets, made of chocolate, now weigh 5 grains instead of the 2½ grains in *B.P.* '85, but they contain as formerly $\frac{1}{100}$ of a grain = 0·0006 gramme of Trinitroglycerin.

Dose.—1 or 2 tablets.

Not Official.

HAUSTUS TRINITRINI.—Solution of Trinitrin, 1 minim; Spirit of Chloroform, 5 minims; Tincture of Capsicum, 2 minims; Peppermint Water, to ½ oz.—*Westminster.*

TABELLA NITROGLYCERINI COMPOSITA.—Nitroglycerin, $\frac{1}{100}$ grain; Menthol, $\frac{1}{50}$ grain; Capsicin, $\frac{1}{100}$ grain; Theobroma Paste, *q.s.*—*Westminster.*

Not Official.

NUCLEIN. NUCLEOL.

The nucleins are compounds of simple proteids with phosphorised bodies, and occur in Yeast, Milk, Yolk of Egg, Thyroid and Thymus glands, etc. Numerous varieties are supposed to exist. Nuclein is extracted by digestion with Pepsin and dilute Hydrochloric Acid, and purification of the residue by repeated solution and precipitation in dilute alkali and dilute acid respectively.

Nuclein is the best known chemical constituent of the nucleus of the white blood corpuscles.

NUCLEIC OR NUCLEINIC ACID.—A white or greyish-white amorphous powder, slightly soluble in Water, insoluble in Alcohol (90 p.c.), and in Ether. It is readily soluble in solutions of Sodium or Potassium Hydroxides with the formation of the corresponding Nucleinates, and it is in the form of 5 p.c. aqueous solutions of these salts that it is chiefly used medicinally.

Medicinal Properties.—A powerful germicide. Stated to possess nutritive properties, and to be useful in increasing the resisting power of the system to pathogenic germs. It has been employed in the treatment of tuberculosis, in anæmia, and in neurasthenia. It has also been employed in diphtheria, and puerperal and scarlet fevers.

1 p.c. solution of nucleinate of Sodium, in physiological solution, subcutaneously injected to moderate peritoneal inflammation after perforation in typhoid, and thus to lessen the risks of subsequent surgical interference. Within 3 days, 3 doses are given.—*B.M.J.* '07, i. 1515.

Prescribing Notes.—*It may be administered hypodermically in the form of a sterilised 5 p.c. solution, dose 17 minims = 1 c.c., or by the mouth as a solution of similar strength, in doses of 1 to 2 fl. drm. = 3·6 to 7·1 c.c.*

ARGENTI NUCLEINAS (Nargol).—A light brownish-yellow powder, containing about 10 p.c. Silver, soluble 1 in 4 of Water. Used as an injection, ¼ to 1 p.c. solution, in gonorrhœa.—*B.M.J.* '01, ii. 1333; *L.* '01, ii. 1809; *M.A.* '02, 701.

CUPRI NUCLEINAS (Cuprol).—A green, colourless, impalpable powder, soluble in Water. Its solution is stated not to coagulate albumen. Has been found useful in powder form in cases of trachoma. Also as a 5 to 10 p.c. aqueous solution in conjunctivitis. Is stated to be less irritating than the Sulphate.—*L.* '01, ii. 729, 1809.

FERRI NUCLEINAS (Triferrin. Ferrinol).—A brown, amorphous, odourless powder, soluble in Water. Has been recommended in anæmia.—*B.M.J.E.* '02, i. 104; ii. 16, 104; *C.D.* '02, i. 580.

Dose.—5 grains = 0·32 grammo.

HYDRARGYRI NUCLEINAS (Mercurol).—A pale yellowish-brown amorphous powder, soluble 1 in 5 Water, insoluble in Alcohol (90 p.c.). Its solution does not coagulate albumen. It has been used as a 2 p.c. injection in urethritis.—*L.* '00, ii. 871. As an antiseptic in the form of a 2½ to 5 p.c. solution in the treatment of diseases of the nose and ear.—*L.* '00, ii. 1726; *T.G.* '01, 92. Given with success in the treatment of syphilis, in average doses of 2 grains three times a day.—*L.* '01, ii. 1039. In gonorrhœa as an injection in the form of a 2 p.c. solution.—*T.G.* '01, 15. Has been found useful in combination with Chloretone and Boric Acid in the treatment of various acute and chronic affections of the skin and mucous membrane.—*T.G.* '01, 636.

SODII NUCLEINAS.—A white or greyish-white amorphous powder, soluble in Water. Employed medicinally, as above described, in the form of a 5 p.c. solution.

NUX VOMICA.

NUX VOMICA.

FR., NOIX VOMIQUE; GER., BRECHNUSS; ITAL., NOCE VOMICA;
SPAN., NUEZ VOMICA.

The dried ripe Seeds of *Strychnos Nux-vomica*, L.

Imported from India, Ceylon, and Cochin China.
The chief source of Strychnine and Brucine.

The total alkaloids have been found to vary between 1·25 and 3·9 p.c. (some Ceylon Seeds gave 5·3 p.c.), but the value of total alkaloids as a medicinal standard is considerably reduced by the fact that the ratio of Strychnine to Brucine may vary as much as 3 to 1 and 1 to 2. The official galenical preparations of Nux Vomica are standardised to a definite percentage of Strychnine, but the *B.P.* does not state what amount of Strychnine should be present in the Seeds. The *U.S.P.* requires that they shall yield not less than 1·25 p.c. of Strychnine; the *P.G.* not less than 2·5 p.c. of total alkaloids as calculated from the result of the official volumetric process, using a factor based on equimolecular proportions of Strychnine and Brucine. The *Brussels Conference* has agreed upon a standard of 2·5 p.c. of total alkaloids. The *Fr. Codex* (1908) has adopted the recommendation of the *Brussels Conference,* and requires that the dried powdered seeds should yield not less than 2 nor more than 3 p.c. of total alkaloids. From 1 to 1·25 p.c. of Strychnine has been suggested (*Y.B.P.* '03, 252) as a suitable standard for inclusion in the next *B.P.*; the dual standard of percentage of total alkaloids and percentage of Strychnine not being advocated. The establishment of a Strychnine standard upon a dual basis by calculating the Brucine into terms of Strychnine has been suggested, *Y.B.P.* '06, 237.

Medicinal Properties.—An excellent gastric and general tonic. Recommended in atonic dyspepsia, in general debility, and in convalescence. It stimulates peristalsis, and therefore is a frequent and valuable ingredient in medicines for chronic constipation. It is also a cardiac and respiratory stimulant. Useful in paralysis of reflex origin, in peripheral paralysis due to alcohol, lead, tobacco, or to diphtheria; in all chronic paralytic affections, except those in which there is organic lesion of nerve-centres or inflammation of brain or spinal cord. *See* also STRYCHNINA.

A report on eight cases of chronic pulmonary tuberculosis, treated with a 'simple mixture of nux vomica, gentian and acid,' compared with similar cases treated with 'Malt and Oil,' results compare most favourably.—*L.* '03, ii. 1016.

Dose.—*In powder* 1 to 4 grains = 0·06 to 0·26 gramme.

Ph. Ger. maximum single dose, 0·1 gramme; maximum daily dose, 0·2 gramme.

Prescribing Notes.—$\frac{1}{13}$ *grain Strychnine is contained in* 1½ *grains of Extract*, 5½ *minims of Fluid Extract*, 33 *minims of Tincture.*

Official Preparations.—Of the **seeds,** Extractum Nucis Vomicæ Liquidum and Strychnina; of the **Liquid Extract,** Extractum Nucis Vomicæ and Tinctura Nucis Vomicæ.

Not Official.—Brucine.

Antidotes.—Emetic of Zinc Sulphate, Mustard, or Ipecacuanha, or hypodermic injection of Apomorphine; Animal Charcoal; Potassium Bromide or Chloral; Amyl Nitrite inhalations; Chloroform or Ether to relax the muscles; hypodermic injection of Curare.—*Murrell.*

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Ger., Jap., Russ. and Swiss, Semen Strychni; Dan., Fr. (Noix Vomique), Hung., Ital. (Noce Vomica), Mex. and Span. (Nuez Vomica), Norw., Port. (Noz Vomica), Swed. and U.S.

Descriptive Notes.—Nux Vomica Seeds are imported from Ceylon, Bombay, Cochin, Madras, and Calcutta. They vary in size and in alkaloidal content, the largest usually yielding most alkaloid; the Ceylon and Bombay Seeds are richer than those imported from Madras and Cochin. The Seeds vary from ¾ to 1 in. (19 to 25 mm.)

in diameter and from $\frac{1}{8}$ to $\frac{1}{4}$ in. (3 to 6 mm.) in thickness. They are circular, nearly flat or somewhat plano-convex, and occasionally irregularly bent, greyish-green in colour, with a satiny lustre from the appressed hairs, the margin rounded or in some kinds acute with a protuberance at the edge indicating the position of the radicle, internally consisting of hard, tough, and horny albumen, in the centre of which is found an embryo with thin, leafy, cordate, palmately-veined cotyledons. The taste is intensely and persistently bitter. *B.P.* gives the same measures as above for the Seeds, *U.S.P.* diameter 15 to 30 mm., thickness 3 to 5 mm. The microscopical characters of the powder are the non-porous thick-walled endosperm cells (*P.G.*), containing fixed Oil and aleurone grains (*U.S.P.*), the hair bases with linear specially formed pits and the cylindrical fragments of the upper part of the hairs, which have a striated appearance.

Tests.—Nux Vomica Seeds may be assayed for their percentage content of Strychnine by any one of several excellent processes. That of the *U.S.P.* is essentially as follows:—A weighed quantity of 20 grammes of the Seeds in No. 60 powder is introduced into an Erlenmeyer flask and is first macerated for 1 hour, with frequent intervals of shaking, with 200 c.c. of a mixture composed of 137·5 c.c. of Ether, 44 c.c. of Chloroform and 13·5 c.c. of Alcohol (94·9 p.c.) and 5 c.c. of Ammonia Solution and subsequently allowed to stand for 12 hours. A measured quantity of 100 c.c. of the clear liquid is decanted into a second separator, the measuring vessel washed out with a little Chloroform and the washings added to the main quantity. The alkaloids are then extracted from the chloroformic solution by agitation with 15 c.c. of Normal Volumetric Sulphuric Acid Solution, care being taken to avoid the formation of emulsion during the shaking; after complete separation the lower acid layer is separated, the Ether-chloroform solution is separated, washed with 2 successive quantities each of 5 and 3 c.c. of Normal Volumetric Sulphuric Acid Solution. The acid liquids in each case are separated as previously and mixed with the main acid quantity. The complete extraction of the alkaloids from the Ether-Chloroform liquid is ensured by testing a drop of the acid liquid with Mercuric Potassium Iodide (Mayer's) Solution, and if a precipitate is produced the shaking is repeated with a further quantity of 5 c.c. of Normal Volumetric Sulphuric Acid Solution; the acid solutions are mixed and sufficient Ammonia Solution added to render the solution alkaline, and the liberated alkaloids are extracted by thoroughly shaking first with 25 c.c. of Chloroform and subsequently repeating the extraction with two successive portions, each of 15 c.c. of Chloroform. The chloroformic solution is in each case separated, transferred to a tared flask, the mixed chloroformic solutions evaporated to dryness on a water-bath and the residue dissolved in 15 c.c. of 3 p.c. Sulphuric Acid by warming it on the water-bath. The solution is allowed to cool and 3 c.c. of a cooled mixture of equal volumes of Nitric Acid (sp. gr. 1·42) and Distilled Water added; the liquid, after it has been rotated a few times, is set aside for exactly 10 minutes, with 3 intervals of gentle rotation; the liquid is transferred to a separator containing 25 c.c. of a 10 p.c. w/v Sodium Hydroxide Solution, the flask being washed out with 3 successive small quantities of Water and the washings added to the main quantity of liquid, which, if not turbid, is mixed with a further measured quantity of 2 c.c. of the Sodium Hydroxide Solution. The liberated alkaloids are then extracted by well rotating the mixture for a few minutes with 20 c.c. of Chloroform, the extraction being repeated with 2 successive quantities of 20 c.c. of Chloroform; the Chloroform solution is separated in each case, filtered through a small filter paper, previously moistened with Chloroform, into a tared flask, the filter and funnel washed with 5 c.c. of Chloroform and the mixed Chloroform solutions evaporated very carefully to dryness on a water-bath. The alkaloidal residue is dissolved in 6 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution, 5 drops of Iodeosin Test Solution are added, about 80 c.c. of Water and 20 c.c. of Ether, the excess of acid is titrated with Fiftieth-normal Volumetric Potassium Hydroxide Solution. The number of c.c. of Fiftieth-normal Potassium Hydroxide Solution is divided by 5, the quotient subtracted from 6, the difference multiplied first by 0·0332 and then by 10 yields the percentage of Strychnine present in the sample. The above process for the separation of Strychnine and Brucine is that originally suggested by Gordin, but, as originally introduced into the *U.S.P.*, it was modified in two essential particulars, such modifications having been vigorously protested against by the author of the process, who considered the modifications quite unwarranted. The method originally suggested by Gordin (*Proc. Amer. Pharm. Assoc.* '02, 341) states, first, that the mixed alkaloids might be dissolved in 15 c.c. of a 3 p.c. Sulphuric Acid Solution by the aid of the water-bath heat, and after the solution is cooled to the ordinary temperature 3 c.c. of a specially prepared and cooled mixture of equal parts of strong Nitric Acid (sp. gr. 1·420) are to be added. Secondly, the mixed Chloroform solutions containing the residual Strychnine are directed to be mixed with 2 or 3 c.c. of pure Amyl Alcohol [b.p. 128° to 132° C. (262·4° to 269·6° F.)], previous to evaporation to dryness. Nitric Acid of a sp. gr. of 1·40 does not affect the oxidation of the Brucine to the extent that an acid of a sp. gr. of 1·42, and requires the addition of a small quantity of Sodium Nitrite to start the reaction. The insufficiency of the original *U.S.P.* official Nitric Acid (sp. gr. 1·40) had been also pointed out (*Proc. Amer. Pharm. Assoc.* '07, 55, 781); however carefully the evaporation of the Chloroform solution is conducted, without the addition of the Amyl Alcohol there is a considerable liability to a loss due to decrepitation, but with the addition of 2 or 3 c.c. of pure Amyl Alcohol no decrepitation takes place. It will be noted that the *U.S.P.* omits the use of Amyl Alcohol. Farr and Wright (*Y.B.P.* '06, 226) have experimented with the *U.S.P.* Nitric Acid process for the determination of Strychnine; they appear to be of the opinion that, notwithstanding the condemnation of the process as contained therein, that process, with slight modifications in the working details, gives perfectly satisfactory results, and that subsequent work has thoroughly established its reliability. The exact details of the process as they have applied it are as follows:—The total alkaloids obtained in the usual way from 5 c.c. of the liquid extract or 25 c.c. of the Tincture are dissolved by the heat of a water-bath in 15 c.c of 3 p.c. Sulphuric Acid Solution, the temperature of the solution adjusted to 50° C. (122° F.); 3 c.c. of a mixture of equal volumes of Nitric Acid (sp. gr. 1·42) and Water added and the mixture set aside for 10 minutes, it is transferred to a separator and shaken with Chloroform, the Chloroform solutions run into a tared dish containing 3 c.c. of Amyl Alcohol. It will be noticed that the above modification by Farr and Wright of the *U.S.P.* process rectifies the identical objections which were urged against the strictly *U.S.P.* process, namely, the gravity of the Nitric Acid Solution used for the oxidation of the Brucine and the addition of Amyl Alcohol to prevent loss by decrepitation of the Strychnine residue. The original process of the *U.S.P.* recommended the use of Nitric Acid of specific gravity 1·40, but the list of alterations and corrections (1907) has altered the specific gravity of the acid to 1·42.

Another modification of the *U.S.P.* method of separating Brucine and Strychnine is described (*A.J.P.* '07, 6). The alkaloidal residue is dissolved in 15 c.c. of 3 p.c. Sulphuric Acid; to the solution is added 3 c.c. of a mixture of equal volumes of Nitric Acid (sp. gr. 1·4) and Distilled Water. Then add 1 c.c. of a 5 p.c. Solution of Sodium Nitrite in Water and, after rotating the liquid a few times, set it aside for exactly 30 minutes, stirring it gently 3 times during the interval; the solution is then made alkaline and shaken out with Chloroform in the usual way.

The influence of Nitrous Acid in the oxidation of Brucine by Nitric Acid has been closely studied by Reynolds and Sutcliffe (*J.S.C.I.* '06, 512), and they conclude that Stoeder's and Gordin's addition led to slightly more accurate results than Keller's original process; of the two, that of Gordin should have the preference, as it is more expeditious. The short Nitric Acid process is generally capable of accurate results if the following points are attended to:—(1) For the amount of total alkaloid up to 0·4 of a gramme, the reacting solution should contain at least 7 p.c. of Nitric Acid. (2) The reaction should be stopped after 10 minutes, when the Brucine is entirely oxidised. (3) The temperature should not exceed 25° C. (77° F.). (4) Excess of Potassium or Sodium Hydroxide should be used to liberate the Strychnine, and not Sodium Carbonate or Ammonia Solution. (5) The Nitric Acid used should be added in the form of sp. gr. 1·42 and not more diluted, otherwise it may be necessary to add a trace of Nitrite to start the reaction.

The *P.G.* process is a volumetric one: a weighed quantity of 15 grammes of the Seeds dried at 100° C. (212° F.) and reduced to a middling fine powder is shaken with 100 grammes of Ether and 50 grammes of Chloroform, and then mixed with 10 c.c. of a solution of 2 parts by weight of Sodium Hydroxide Solution (15 p.c.) and 1 part by weight of Water, and the residue is allowed to stand for 3 hours with intervals of vigorous shaking. A measured quantity of 15 c.c. or a sufficient quantity of Water to cause the powdered Nux Vomica to agglomerate and the supernatant Chloroform-Ether solution to separate completely clear, is then added. After standing for an hour 100 grammes of the clear Ether-Chloroform solution are filtered through a dry, well-covered filter into a flask, and about half of the liquid distilled; the remaining Chloroform-Ether solution is transferred to a separator, the flask being washed out with 3 successive quantities each of 5 c.c. of a mixture of 3 parts by weight of Ether, and 1 part by weight of Chloroform. The alkaloids are extracted from the mixed liquids by agitation with 10 c.c. of Tenth-normal Volumetric Hydrochloric Acid Solution. After complete separation of the liquids sufficient Ether is added to cause the Chloroform-Ether solution to float on the top of the acid liquid, the latter is filtered through a small filter previously moistened with Water into a flask of 100 c.c. capacity. The Chloroform-Ether solution is shaken with 3 successive quantities, each of 10 c.c. of Water, the aqueous liquids being filtered through the same filter, the filter is washed with Water and the mixed filtrate and washings diluted with Water to 100 c.c. A measured quantity of 50 c.c. of this solution is removed, introduced into a flask of white glass of about 200 c.c. capacity; 50 c.c. of Water and sufficient Ether to form a layer of 1 cm. added, and the mixture titrated with Hundredth-normal Volumetric Potassium Hydroxide Solution, using 5 drops of Iodeosin Solution as an indicator of neutrality; not more than 15 c.c. of Hundredth-normal Volumetric Potassium Hydroxide Solution shall be necessary to neutralise the excess of Tenth-normal Hydrochloric Acid; the number of c.c. of Hundredth-normal Volumetric Hydroxide Solution used divided by 10, the quotient multiplied first by 2, then subtracted from 10 and the difference multiplied by 0·00364 (the mean molecular equivalents of Strychnine and Brucine), then by 10 gives the percentage of total alkaloid present in the Seeds.

Preparations.

EXTRACTUM NUCIS VOMICÆ. Extract of Nux Vomica.

Prepared from Liquid Extract of Nux Vomica, and readjusted by means of Milk Sugar to contain 5 p.c. of Strychnine.

The *B.P.* extract is prepared by the evaporation of the liquid extract, which is officially required to contain 1·5 p.c. w/v of Strychnine. The solid extract is officially required to contain 5 p.c. of Strychnine.

The *U.S.P.* extract is prepared direct from the powdered Seeds, the menstruum being a mixture of Acetic Acid and Water; it is required to contain 5 p.c. of Strychnine. The *P.G.* extract is also prepared from the powdered Seeds, using the menstruum Alcohol (68 to 69 p.c.), and is required to contain not less than 17·5 p.c. w/w of mixed alkaloids. The Extract official in the *Fr. Codex* (1908) is prepared from the Nux Vomica Seeds in No. 22 powder, the menstruum being Alcohol (70 p.c.). It is required to contain exactly 16 p.c. of total alkaloids in conformity with the recommendation of the *Brussels Conference.*

Dose.—$\frac{1}{4}$ to 1 grain = 0·016 to 0·065 gramme.

Ph. Ger. maximum single dose, 0·05 gramme; maximum daily dose, 0·10 gramme.

Often prescribed with Aloes and Ipecacuanha.

This Extract is intended to be about two-thirds the strength of that in *B.P.* 1885. *Ph. Ger.* Extractum Strychni is standardised to contain 17·5 p.c. of total alkaloids, and is therefore rather stronger than *B.P.* 1885.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Jap., Russ., Span. and Swiss, use 68 to 70 p.c. Alcohol; Ital. and Mex., 80 p.c.; Norw. and Swed., 65 p.c.; Port., 90 p.c.; U.S. extract with Acetic Acid and Water, and subsequently add Alcohol (95 p.c.). All from the Seeds. Austr., Belg., Dutch, Fr., Span. and Swiss adopt the International Standard, 16 p.c. of alkaloids; Dan. and Swed., 15 to 17 p.c.; Ital., 10 p.c.; Mex., 15 p.c.; Russ., 15 p.c.; U.S., 5 p.c. of Strychnine. Ger. and Jap., 17·5 p.c.

Tests.—No official method is given for the determination of the Strychnine in the *B.P.* extract, it being apparently assumed that the liquid extract used in its preparation contains the necessary proportion of alkaloid.

The *U.S.P.* dissolves in a beaker a weighed quantity of 2 grammes of the extract in 25 c.c. of a mixture of 16 c.c. of Ether, 5 c.c. of Chloroform, and 4 c.c. of Ammonia Solution; transferring it when dissolved to a separator and washing the beaker with a little Chloroform, transferring the washings also to the separator. The alkaloids are extracted by agitating the mixture for a few minutes, the aqueous layer is transferred to a second separator, the Ether solution and the first separator being washed with a little Water and the washings separated and added to the second separator. The alkaloids remaining in the aqueous liquid are extracted by agitation with 2 successive portions each of 15 and 10 c.c of Chloroform, the Chloroform solutions are separated and added to the Ether solution contained in the first separator. The complete extraction of the alkaloids from the aqueous liquid is ensured by removing a few drops, rendering them acid and testing with Mercuric Potassium Iodide (Mayer's) Solution, and if a reaction is obtained repeating the shaking with a fresh quantity of 10 c.c. of Chloroform. The alkaloids are extracted from the mixed Ether-Chloroform solutions contained in the first separator by agitation with 3 successive quantities each of 15, 10, and 10 c.c. of 3 p.c. Sulphuric Acid Solution, the acid layer being in each case separated, mixed and transferred to another separator; sufficient Ammonia Solution to render the mixture alkaline is added and the liberated alkaloids are extracted by agitation with 3 successive quantities of 15 c.c., 10 c.c., and 10 c.c. of Chloroform; the Chloroform solutions are separated in each case, transferred to a beaker, and evaporated on a water-bath. The alkaloidal residue is dissolved in 15 c.c. of a 3 p.c. Sulphuric Acid Solution whilst still on the water-bath, removed and allowed to cool. A measured quantity of 3 c.c. of cooled mixture of equal volumes of Nitric Acid (sp. gr. 1·42) and Water are added, the liquid rotated a few times, set aside for exactly 10 minutes, during which it is gently stirred 3 times. The red liquid is transferred to a separator containing 25 c.c. of a 10 p.c. w/v Sodium Hydroxide Solution, the beaker washed with 3 successive very small amounts of Water and the washings transferred to the separator, a further quantity of 2 c.c. of the Sodium Hydroxide Solution being added, should the liquid be not quite turbid. The liberated alkaloids are extracted by agitation with 20 c.c. of Chloroform, adopting a rotatory motion, the complete extraction of the alkaloids being ensured by shaking with 2 further successive quantities of 10 c.c. of Chloroform, the same rotatory method being adopted in the shaking; the Chloroform solutions are separated in each case, filtered through a small filter previously wetted with Chloroform into a tared flask; the filter and funnel are washed with 5 c.c. of Chloroform. The mixed Chloroform liquids evaporated very carefully to dryness on a water-bath, the alkaloidal residue is dissolved in 10 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution, about 90 c.c. of Distilled Water and 20 c.c. of Ether and about 5 drops of Iodeosin Solution are added and the excess of Volumetric Acid Solution is titrated with Fiftieth-normal Volumetric Potassium Hydroxide Solution; the number of c.c. used is divided by 5, the quotient is subtracted from 10, the difference is multiplied first by 0·0332 and then by 50, which yields the percentage of Strychnine present in the extract.

The *P.G.* dissolves a weighed quantity of 1 gramme of the extract in 5 grammes of Water and 5 grammes of Absolute Alcohol, and adds to this solution 50 grammes of Ether and 20 grammes of Chloroform, and after vigorous shaking adds 10 c.c. of a 1 in 3 solution of Sodium Carbonate and allows the mixture to stand for an hour with frequent intervals of vigorous agitation. A weighed quantity of 50 grammes of the clear Chloroform solution is filtered through a dry, well-covered filter into a flask, and about half of the liquid is distilled, the remaining Chloroform solution is introduced into a separator, the flask is washed with 3 successive quantities each of 5 c.c. of a mixture of 3 parts by weight of Ether, and 1 part by weight of Chloroform, and the alkaloids are extracted from the mixed liquids by shaking with 50 c.c. of Hundredth-normal Volumetric Hydrochloric Acid Solution. When the clear liquids have completely separated, and after the addition of sufficient Ether to cause the Chloroform-Ether solution to float on the acid liquid, the latter is separated, filtered through a small filter previously moistened with Water into a stoppered flask of white glass of a capacity of about 200 c.c. The Chloroform-Ether solution is washed with 3 successive quantities each of 10 c.c. of Water, the washings filtered through the same filter, the filter washed with Water, and the mixed filtrate and washings diluted with Water to about 100 c.c. After the addition of sufficient Ether to form a layer of 1 cm., sufficient Hundredth-normal Volumetric Potassium Hydroxide Solution is added to neutralise the excess of the Volumetric Acid Solution, Iodeosin Solution being employed as an indicator of neutrality. The number of c.c. of hundredth-normal alkali solution subtracted from 50, the difference multiplied by 0·00364 (the mean molecular equivalent of Strychnine and Brucine) and the product multiplied by 100, and this product divided by 0·711 yields the percentage of total alkaloids present in the extract.

EXTRACTUM NUCIS VOMICÆ LIQUIDUM. Liquid Extract of Nux Vomica.

A fluid prepared by percolation with Alcohol (70 p.c.) and standardised to contain 1·5 grammes of Strychnine in 100 c.c.

The liquid extract is officially required to contain 1·5 p.c. w/v of Strychnine. The *U.S.P.* Fluid Extract is required to contain 1 p.c. w/v of Strychnine; neither the *P.G.* nor the *Fr. Codex* (1908) contains a Fluid Extract of Nux Vomica.

Dose.—1 to 3 minims = 0·06 to 0·18 gramme.

Foreign Pharmacopœias.—Official in Mex. and U.S. The *U.S.P.* extracts with a mixture of Alcohol (95 p.c.) 3, Water 1, to which Acetic Acid has been added; it is standardised so that each 100 c.c. of finished Fluid Extract shall contain 1 gramme of Strychnine.

The *Brussels Conference* agreed to prepare the Extract by means of Alcohol (70 p.c.) and to an alkaloidal strength of 16 p.c.

Tests.—Fluid Extract of Nux Vomica has a sp. gr. of 0·945 to 0·965; it contains from 9 to 12 p.c. of total solids and about 58 p.c. w/v of Absolute Alcohol. The proportion of total solids may amount to as much as 20 p.c., but will largely depend upon the Strychnine content of the Seeds used in preparing the liquid extract. It has been pointed out (*Y.B.P.* '06, 236) that it is evident, in fixing the official standard at 1·5 p.c., somebody has blundered, for it is palpably impossible to produce from a drug which rarely contains as much as 1·5 p.c. of Strychnine, a 1 in 1 preparation standardised to contain that amount.

The *B.P.* method of determination, which has been very severely and adversely criticised, is essentially as follows:—A measured quantity of 10 c.c. of the liquid extract is evaporated to the consistency of a thick syrup by heating on a water-bath, and the resulting extract is dissolved in 20 c.c. of Water, transferred to a separator and the solution mixed with a solution of 5 grammes of Sodium Carbonate in 25 c.c. of Water. The liberated alkaloids are extracted by agitation with 3 successive quantities each of 10 c.c. of Chloroform, the Chloroform solutions being in each instance separated and transferred to a second separator. Unless the fat has been previously extracted from the Seeds a considerable quantity of fatty matter is present, which gives rise to the formation of troublesome emulsions at this stage of the process, the Chloroform obstinately emulsifying and refusing to separate. The alkaloids are in turn extracted from the mixed chloroformic liquids by agitation with 3 successive quantities each of a third part of a mixture of 6 c.c. of diluted Sulphuric Acid with 25 c.c. of Water. The acid solutions are in each instance separated, mixed, diluted with Water to 175 c.c. and transferred to a stoppered bottle in which after being made up to 200 c.c. with Potassium Ferrocyanide Solution they are well and frequently shaken for thirty minutes. The separation of the mixed alkaloids is based on the insolubility of the Strychnine as compared with that of the Brucine Ferrocyanide, an observation due to Beckurts, and subsequently utilised by Dunstan and Short (*Y.B.P.* 1883, 469), for the determination of

Strychnine in the presence of Brucine. Unless strict attention be paid to the temperature at which the precipitation is carried out and that the solution be well agitated during the addition of the Ferrocyanide, Brucine will be also precipitated with Strychnine. The mixture is allowed to stand for 6 hours to allow complete precipitation, the supernatant fluid is decanted, filtered through a small filter, the precipitate transferred to the same filter, the precipitate remaining in the bottle is also transferred to the filter by washing it out with some of the clear filtrate and then with Water containing one-fortieth of its volume of diluted Sulphuric Acid, and the precipitate is washed until the washings are free from bitterness. If this stage of the process be strictly followed considerable loss of alkaloid will result, as the Strychnine Ferrocyanide is not completely insoluble in this menstruum. The precipitate is then transferred to a separator, mixed with 5 c.c. of Ammonia Solution, and well shaken, and the liberated alkaloids are extracted by agitation with 2 successive quantities each of 15 c.c. of Chloroform; the Chloroform solutions in each instance being separated, transferred to a tared flask and the mixed chloroformic liquids evaporated on a water-bath, the residue being dried for 1 hour at a water-bath temperature, or preferably till constant in weight; cooled and weighed. If the final Chloroform solutions are evaporated, as officially directed, in a counterpoised dish, there is considerable liability to loss by decrepitation, which may be avoided by the addition of a few c.c. of Amyl Alcohol to the chloroformic liquids previous to evaporation. The calculated yield of alkaloids from the 10 c.c. of liquid extract directed by the *B.P.* to be employed in the test is 0·32 of a gramme, and the process upon which the separation was founded directs the employment of any quantity of liquid yielding not more than 0·2 of a gramme of mixed alkaloids. Several useful suggestions have been made with a view of overcoming the defects of the Pharmacopœia process. Farr and Wright have suggested (*Y.B.P.* '00, 450) the following modifications: that the volume of liquid taken should not exceed 5 c.c. of the liquid extract or 30 c.c. of Tincture, that 200 c.c. of Water at a stated temperature, preferably 38° C. (100·4° F.) should be employed and a correction made for the Strychnine dissolved, and that in carrying out the process the Pharmacopœia instructions as to a simple agitation without stirring and as to the length of time allowed for precipitation of the Strychnine are to be strictly observed, as success depends altogether upon the conditions under which the process is carried out. Bird has suggested the addition of 2 c.c. of pure Amyl Alcohol to the final Chloroform solution of the alkaloid before evaporation: it prevents decrepitation of the Strychnine when the residue dries. He has also suggested the removal of the fat by a preliminary shaking out with Chloroform in acid solution before starting the assay, the traces of alkaloid dissolved by the Chloroform solution of the fat being recovered by shaking the Chloroform solution again with acid. Naylor (*Y.B.P.* '05, 364) is of opinion that the difficulties attending that part of the official process which refers to the separation of the

Brucine and Strychnine, even assuming the adoption of the minute precautions proposed by Farr and Wright, cannot confidently be affirmed to have been surmounted, and it is imperative that attention to details of an unusually exacting character be carefully observed if results claiming to be concordant are to be obtained. Later results have shown that a more expeditious, easier, and certainly a more accurate method of separating Brucine from Strychnine consists in oxidising it with Nitric Acid in the presence of Sulphuric Acid. The process was worked out by Gordin and is given *in extenso* in the *Proceedings of the American Pharmaceutical Association* 1902, vol. l., p. 336. The residue of total alkaloids obtained in the assay of Nux Vomica or its preparations is dissolved in 15 c.c. of 3 p.c. Sulphuric Acid Solution by the aid of a water-bath heat, the solution is cooled to ordinary temperature and 3 c.c. of a previously prepared and cooled mixture of equal parts of strong Nitric Acid (sp. gr. 1·42) and Water added to the alkaloidal solution; the liquid is set aside for exactly 10 minutes, shaking it gently 3 or 4 times during this time. The red liquid is transferred to a separator containing 20 to 25 c.c. of a 10 p.c. w/v Sodium Hydroxide Solution, and the vessel in which the digestion of the alkaloids has taken place is washed 3 or 4 times with very small amounts of Water, the washings being added to the contents of the separator. In the event of the liquid not being turbid a further addition of 1 or 2 c.c. of the Sodium Hydroxide Solution should be made; the liberated alkaloids are shaken out with 3 successive quantities of 20 c.c., 10 c.c. and 10 c.c. of Chloroform. The chloroformic liquids are separated, filtered through a small filter paper previously moistened with Chloroform into a tared flask, the filter washed with Chloroform. To the mixed Chloroform solutions are added 2 or 3 c.c. of pure Amyl Alcohol distilling between 128° and 132° C. (262·4° to 269·6° F.), the mixed solutions are evaporated to dryness, the residue dried for about 2 hours at a temperature of 135° to 140° C. (275° to 284° F.), and when cold weighed. If the fat be removed, as suggested above by Bird's modification, the mixed alkaloids can be separated by the above process, the combination of the two processes yielding results of a satisfactory and concordant nature.

The *U.S.P.* method of determining the Strychnine in the Fluid Extract is as follows:—A measured quantity of 10 c.c. of the Fluid Extract is transferred to a porcelain evaporating basin and evaporated on a water-bath to dryness, the residue whilst warm being dissolved in a mixture of 16 c.c. of Ether, 5 c.c. of Chloroform, and 4 c.c. of Ammonia Water, the solution being transferred to a separator, the dish rinsed with a little Chloroform and the washings added to the separator, which is carefully shaken for a few minutes. After the liquids have separated the aqueous layer is removed to another separator, the Ether-Chloroform liquid is washed with a little Water and the washings added to the second separator, and the aqueous liquid in the second separator is shaken with 2 successive quantities each of 15 and 10 c.c. of Chloroform, which are added to the Chloroform solution in the first separator. Complete extraction of the alkaloids is ensured by acidifying a few drops of the aqueous liquid remaining after Chloroform extraction and testing with Mercuric Potassium Iodide (Mayer's) Solution; if a reaction is obtained, a further shaking with 10 c.c. of Chloroform is carried out. The alkaloids are extracted from the Ether-Chloroform mixed with the Chloroform liquids in the first separator by shaking with 3 successive quantities each of 25, 10 and 10 c.c. of Normal Volumetric Sulphuric Acid Solution. The acid solutions are separated in each case, transferred to a separator, and the mixed acid solutions rendered alkaline with sufficient Ammonia Solution, and the liberated alkaloids shaken out with 3 successive quantities each of 25, 10 and 10 c.c. of Chloroform. The Chloroform solutions are separated in each case, transferred to a beaker, and the mixed chloroformic liquids evaporated to dryness on a water-bath. The alkaloidal residue is dissolved in 15 c.c. of 3 p.c. Sulphuric Acid Solution by the heat of the water-bath, allowed to cool, mixed with 3 c.c. of a cooled mixture of equal volumes of Nitric Acid (sp. gr. 1·42) and Distilled Water, and after rotating the liquid a few times, set aside for exactly 10 minutes, during which interval it is gently stirred on 3 successive occasions. The red liquid is transferred to a separator containing 25 c.c. of 10 p.c. w/v Sodium Hydroxide Solution, the beaker washed with 3 successive very small quantities of Water, and the washings transferred to the separator; a further quantity of 2 c.c. of the Sodium Hydroxide Solution is added in the event of the liquid not becoming turbid. The liberated alkaloids are extracted by shaking well (adopting a rotatory motion) with 3 successive quantities of 20, 10 and 10 c.c. of Chloroform, the Chloroform solutions in each case being separated, filtered through a small filter previously moistened with Chloroform, the filter and funnel washed with 5 c.c. of Chloroform; the mixed Chloroform solutions and washings carefully evaporated by means of the water-bath to avoid decrepitation, and the alkaloidal residue is dissolved in 10 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution, about 80 c.c. of Water and 20 c.c. of Ether. The excess of acid is titrated with Fiftieth-normal Volumetric Potassium Hydroxide Solution, using 5 drops of Iodeosin T.S. as an indicator of neutrality. The number of c.c. of Fiftieth-normal Volumetric Potassium Hydroxide Solution required divided by 5, the quotient subtracted from 10, the difference multiplied first by 0·0332 and then by 10 yields the percentage of Strychnine present in the Fluid Extract.

TINCTURA NUCIS VOMICÆ. TINCTURE OF NUX VOMICA. *N.O.Syn.*—TINCTURA STRYCHNI.

Liquid Extract of Nux Vomica, 2; Distilled Water, 3; Alcohol (90 p.c.), *q.s.* to yield 12.

It is about twice the strength of the *B.P.* 1885 Tincture.

The *B.P.* Tincture of Nux Vomica is required to contain not less than 0·24 p.c. w/v nor more than 0·26 p.c. w/v of Strychnine. The *U.S.P.* Tincture is required to contain 0·1 p.c. w/v of Strychnine. The *P.G.* Tincture is required to contain not less than 0·25 p.c. w/v of mixed alkaloids.

The *B.P.* Tincture is prepared from the standardised liquid extract. The *U.S.P.* Tincture is prepared from the standardised extract. The *P.G.* Tincture is prepared from the powdered Seeds. The Tincture official in the *Fr. Codex* (1908) is prepared in accordance with the recommendations of the *Brussels Conference*, namely, from the extract, using Alcohol (70 p.c.), and is required to contain 0·25 p.c. of total alkaloids.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Ph. Ger. maximum single dose, 1·0 gramme; maximum daily dose, 2·0 grammes.

Foreign Pharmacopœias. Official in Austr., Belg., Dan., Dutch, Ger., Ital., Jap., Norw., Russ., Span., Swed. and Swiss, 1 in 10; Hung., Mex. and Port., 1 in 5; all prepared from the **seeds.** U.S., 1 Extract in 50. All by weight, except U.S.

Tests.—Tincture of Nux Vomica should have a sp. gr. of 0·890 to 0·915. It contains from 2 to 3 p.c. w/v of total solids and about 64 p.c. w/v of Absolute Alcohol. It is officially required to yield the percentage of Strychnine shown above. The *B.P.* method of determination is similar to that adopted for the assay of the liquid extract, 100 c.c. of the Tincture are evaporated to the consistency of a thick extract and the process continued as described under the Liquid Extract. The same comments as there appear are naturally applicable to the adaptation of the process to the Tincture.

The *U.S.P.* method is to evaporate a measured quantity of 100 c.c. of the Tincture to dryness on the water-bath, and to determine the amount of Strychnine present by the method of assay as given under Extractum Nucis Vomicæ. The final multiplication by 50 must in this instance be omitted, as the result will represent the percentage w/v of Strychnine present in the Tincture. The remarks regarding the Nitric Acid process for the separation of Brucine and Strychnine apply here. The German Pharmacopœia evaporates a weighed quantity of 50 grammes of the Tincture in a tared evaporating dish to the weight of 10 grammes and transfers the residue to a stoppered vessel with 5 grammes of Absolute Alcohol; the mixture is shaken with 50 grammes of Ether and 20 grammes of Chloroform, 10 c.c. of a 1 in 3 Sodium Carbonate Solution (which has been used to transfer the last traces of the residue left in the evaporating basin to the stoppered vessel) added, and the mixture allowed to stand for 1 hour with frequent intervals of vigorous shaking. A weighed quantity of 50 grammes of the clear Chloroform-Ether solution is filtered through a dry, well-covered filter into a flask, and about half the liquid distilled, the remaining Chloroform-Ether solution is introduced into a separator, the flask is washed with 3 successive quantities of 5 c.c. of a mixture of 3 parts by weight of Ether, and 1 part by weight of Chloroform, and the alkaloids are removed from the mixed fluids by shaking thoroughly with 40 c.c. of Hundredth-normal Volumetric Hydrochloric Acid Solution. After complete separation sufficient Ether is added to cause the Chloroform-Ether solution to float on the surface of the acid liquid. The latter is filtered through a small filter previously moistened with Water into a stoppered flask of about

200 c.c. capacity, the Chloroform-Ether solution is washed with 3 successive quantities each of 10 c.c. of Water and the washings filtered through the same filter, which is finally washed with Water, and the mixed filtrate and washings are diluted with Water to about 100 c.c. After the addition of sufficient Ether to form a layer of about 1 cm., the excess of volumetric acid is titrated with Hundredth-normal Volumetric Potassium Hydroxide Solution, using 5 drops of Iodeosin Solution as an indicator of neutrality, the mixture being well shaken after each addition. It is required that not more than 17 c.c. of the Hundredth-normal Solution shall be necessary. The number of c.c. of Hundredth-normal Volumetric Potassium Hydroxide Solution required is subtracted from 40, the difference multiplied by 0·00364 (the mean molecular equivalents of Strychnine and Brucine), the product multiplied by 100 and divided by $33\frac{1}{3}$ yields the percentage w/w of total alkaloids present in the Tincture.

STRYCHNINE.—*See* STRYCHNINA.

Not Official.

BRUCINE ($C_{23}H_{26}N_2O_4.4H_2O$, eq. 462·85).—Colourless, transparent, monoclinic crystals, containing about 15 p.c. of Water. Its salts are bitter, and most of them crystallisable.

It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from contact with air, as the crystals quickly effloresce when exposed to dry air.

Solubility.—But slightly soluble in Water; 1 in 20 of Alcohol (90 p.c.), 1 in 2 of Chloroform, with separation of the combined Water.

Brucine resembles Strychnine in its physiological action, but is weaker.

Dose.—$\frac{1}{10}$ to $\frac{1}{2}$ grain = 0·006 to 0·032 gramme.

It possesses analgesic properties, in 5 p.c. solutions of the **Sulphate** or **Nitrate** applied locally.—*T.G.* '85, 376; '86, 18.

Tests.—Brucine rapidly loses its Water of crystallisation when exposed to dry air or over Sulphuric Acid at 100° C. (212° F.) it becomes anhydrous, the anhydrous product melting at 178° C. (352·4° F.) the aqueous solution is lævogyrate; the alkaloid dissolves in concentrated Sulphuric Acid without colour. Concentrated Nitric Acid, or Sulphuric Acid containing Nitric Acid, produces a blood-red coloration, passing to orange and finally to yellow. The salts produced when Brucine is neutralised with acid are neutral in reaction towards the customary indicators of neutrality, and the alkaloid may therefore be titrated direct with Normal or Tenth-normal Hydrochloric or Sulphuric Acid Solution, using Iodeosin Solution as an indicator of neutrality. 1 c.c. of Normal Sulphuric or Hydrochloric Acid Solution is equivalent to 0·39133 gramme of anhydrous Brucine or 0·46285 gramme of hydrated Brucine. Brucine should be free from Strychnine, its presence may be detected by oxidising the Brucine with Nitric Acid, shaking out the Strychnine by an immiscible solvent and applying the Sulphuric Acid and Potassium Bichromate test when no violet or purple-violet coloration should be produced.

OLEA.

In the British Pharmacopœia the term **Oleum** is applied to an Oil (whether expressed or distilled), as it is also in Austr., Dutch, Ger., Hung., Jap., Russ. and U.S. The other names for fixed and volatile Oils respectively are: Belg., **Oleum** and **Essentia**; Dan., Norw. and Swed., **Oleum** and **Ætheroleum**; Fr., **Huile** and **Essence**; Ital. **Olio** and **Essenza**; Mex., **Aceite** and **Aceite Volatil**; Port., **Oleo** and **Essencia**; Span., **Aceite** and **Esencia.**

Elæosaccharum.—A title used in the Foreign Pharmacopœias to denote a trituration of an Essential Oil with Sugar. Austr., Dutch, Russ. and Swiss use 1 drop of the Oil to 2 grammes of Sugar; Belg., Dan. and Norw., Oil 1, Sugar 49; Ger., Jap. and Swed., Oil 1 gramme, Sugar 50 grammes; they are all practically the same strength. Ital. (Oleosaccari), Oil 1 gramme, and Sugar 20 grammes; Span., Oil 1, Sugar 25.

Not Official.

OLEATES.

Some of these preparations have come into general use. They were originally made by dissolving the oxide of the metal, or an alkaloid, in an excess of Oleic Acid; but later Dr. Shoemaker proposed the method of precipitation by double decomposition between a salt of the base and Solution of Castile Soap (Sodium Oleate with a little Palmitate); Solution of Potassium Oleate may be used with advantage in place of the Solution of Castile Soap, when the pure Oleate is required. The Oleate can also be purified from Palmitate by solution in Petroleum Spirit.

The various Oleates will be found under the headings of their respective bases.

OLIVÆ OLEUM.

OLIVE OIL.

FR., HUILE D'OLIVE; GER., OLIVENÖL; ITAL., OLIO DI OLIVE; SPAN., ACEITE DE OLIVAS.

A clear, pale yellow, or greenish-yellow, oily fluid, possessing a faint characteristic odour and bland oily taste.

It is expressed from the ripe Fruit of *Olea Europæa.*

Chiefly obtained from the south of Europe.

Adulteration of Olive Oil is very general, large quantities of Cottonseed and other Oils being used for admixture.

On exposure to the air it is apt to become rancid, acquiring a disagreeable smell.

Solubility.—1 in 2 of Ether; partially in Alcohol (90 p.c.).

Medicinal Properties.—Nutritious and mildly laxative, demulcent in the form of emulsion; externally as a lubricant in massage, also as an emollient and protective for burns and certain cutaneous diseases. 4 to 8 fl. oz. daily, and also larger quantities, have been given in cases of gall stones. Used as a laxative enema, especially for intestinal obstruction (5 oz. warm Oil, with or without 8 oz. warm Starch Mucilage). Given by the mouth in corrosive poisoning. It is most extensively employed in pharmacy, in the preparation of certain liniments, ointments and plasters.

Its use in typhoid is regarded (*B.M.J.* '05, i. 414) as a perfect boon. A breakfast-cupful is administered as an injection by the bowel for the first four or five days at intervals of 12 to 24 hours, and subsequently every second day. ½ to 1 fl. oz. every four hours may also be given by the mouth without producing nausea.

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c., or more.

Prescribing Notes.—*It may be given as* **capsules,** *or in emulsion:* 1 *oz. of Olive Oil with* 180 *grains of powdered Gum Acacia and Water to* 2 *oz. Olive Oil mixes well with Malt Extract. Heated to* 120° *to* 140° *C. in a small flask* (*plugged with Cotton-Wool*) *for half an hour, it forms* **Oleum Asepticum** *or* **Sterilised Olive Oil.** *Almond Oil and Liquid Paraffin can be sterilised in a similar manner.*

Official Preparations.—Used in the preparation of Emplastrum Ammoniaci cum Hydrargyro, Emplastrum Hydrargyri, Emplastrum Picis, Emplastrum Plumbi, Linimentum Ammoniæ, Linimentum Calcis, Linimentum Camphoræ, Sapo Durus, Sapo Mollis, Unguentum Capsici, Unguentum Hydrargyri Compositum, Unguentum Hydrargyri Nitratis, and Unguentum Resinæ.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex. (Aceite de Olivo), Norw., Port. (Azeite), Russ., Span. (Aceite), Swed., Swiss and U.S. Ger. and Russ. have also Oleum Olivarum Commune. Fr. has also Huile d'Olive purifiée et sterilisée.

Tests.—Olive Oil has a sp. gr. of 0·915 to 0·918. Five samples examined in the author's laboratory had sp. gr. of 0·916 to 0·917, averaging 0·916. The *B.P.* gravities are 0·914 to 0·919, the *U.S.P.* 0·910 to 0·915 at 25° C. (77° F.), and the *P.G.* 0·915 to 0·918. It is officially stated to be liable to assume a pasty consistency at 10° C. (50° F.) and at 0° C. (32° F.) to form a nearly solid granular mass. The *U.S.P.* states that when cooled from 8° to 10° C. (46·4° to 50° F.) it becomes somewhat cloudy from separation of crystalline particles, and at 0° C. (32° F.) it forms a whitish granular mass. The *P.G.* statement is essentially the same as that of the British Pharmacopœia. The congealing point depends greatly upon the length of time to which the Oil is exposed to cold, for instance, the Oil cooled by Ether to −12·8° C. (9° F.) remained unchanged, but when kept at 0° C. (32° F.) for 4 hours it partially solidified. Some samples of Oil pressed in the author's laboratory from Olives grown in the south of France showed no sign of congelation during 6 hours at 0° C. (32° F.) or 3 hours at −9·4° C. (15° F.). On the other hand, in the following year an Oil from the same district (guaranteed pure) set at once when cooled to −10·6° C. (13° F.) and within 2 hours at 0° C. (32° F.). It has since been discovered that the non-freezing Oil is only produced when the fruits have been allowed to over-ripen. The Saponification value and the Iodine absorption afford a useful means of judging the purity of an Olive Oil, but neither are referred to in the *B.P.* The Saponification value should be about 190, the Iodine absorption not less than 80. The *U.S.P.* gives the Saponification value of 191 to 195 and an Iodine absorption of not less than 80 nor more than 88. The *P.G.* makes no reference to the Saponification value, but gives an Iodine absorption of not less than 80 and not more than 84. Five samples of genuine Oil examined in the author's laboratory gave from 189·7 to 198·3 for the Saponification value, with an average of 194·1 and 81·28 to 83·82, with an average of 82·80 for the Iodine absorption. Five other samples of genuine Oil examined for their Iodine value alone showed from 81·28 to 82·82, with an average of 82. Adulteration of Olive Oil is very general, large quantities of Cottonseed and other Seed Oils, Sesame Oil and other Oils being used for the admixture. The *B.P.* includes a test for Cottonseed Oil which is performed by shaking a measured quantity of 10 c.c. of the Oil with 2 c.c of a mixture containing 1 p.c. solution of Silver Nitrate in Absolute Alcohol, to which is added 20 p.c. w/v of Ether and a drop of Nitric Acid. It is officially required that no blackening should occur when the mixture is heated on a water-bath for 10 minutes. The *U.S.P.* employs an alcoholic solution of Silver Nitrate acidulated with Nitric Acid as described below, but it contains no Ether. The *U.S.P.* contains a useful test for the detection of Cottonseed, and is essentially that given in the 17th Edition of the *Companion* and which was suggested to the author by Mr. E. J. Bevan and described under Adeps. It consists in heating a few c.c. of the Oil with 1 c.c. of a 1 p.c. solution of Sulphur in Carbon Bisulphide in a salt-bath for about half an hour, no reddish colour should be developed. The *B.P.* test is essentially Bechi's Silver Nitrate test, it is more generally carried out on the fatty acids of the Oil, and not on the glycerides. The *U.S.P.* and *P.G.* include an Elaïdin test with Nitric Acid, which is described in the small type below; this forms a useful means of detecting sophisticated Oil.

The Sugar test is adopted by the *U.S.P.* for the detection of Sesame Oil, a 1 p.c. solution of Sugar in Hydrochloric Acid (sp. gr. 1·18) being employed: the test is described below. It frequently contains an excessive amount of free fatty acid, but no test for it is included in *B.P.*, *U.S.P.* or *P.G.* The free acid may be determined by warming 5 or 10 grammes of the Oil with 25 c.c. of Alcohol (90 p.c.), cooling and titrating the alcoholic solution with Tenth-normal Volumetric Potassium or Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. 1 c.c. of Tenth-normal Volumetric Alkali Solution represents 0·028014 gramme of Oleic Acid. The above-mentioned five samples showed from a mere trace to 1·4 p.c. of free acid, with an average of 0·875 p.c. Mineral Oil, if present, may be determined by the amount of unsaponifiable residue; the Oil is saponified with Alcoholic Potassium Hydroxide Solution, evaporated to dryness to remove the Alcohol, the residue is dissolved in Water and the unsaponifiable Oil shaken out with Ether, the ethereal solution evaporated, the residue dried at 100° to 105° C. (212° to 221° F.) till constant, the residue cooled and weighed. Cottonseed, Rape, or Linseed Oils may be detected by the increased Iodine absorption, as also may Fish Oils. The m.p. of the fatty acids obtained from the Oil also affords a useful indication of the nature of the adulteration. Arachis Oil, which gives an Elaïdin test very similar to Olive Oil, may be detected by the isolation of Arachidic Acid.

A test for the absence of Sesame Oil has been suggested with Pyrogallol Solution; 10 c.c. of the Oil are shaken with 10 c.c. of a freshly prepared solution of Pyrogallol (2 grammes) in Hydrochloric Acid (30 grammes) and the separated acid liquid heated in a water-bath for 10 minutes, no distinct violet coloration should be produced.

Nitric Acid.—On vigorously shaking 2 c.c. of the Oil and 2 c.c. of Nitric Acid (sp. gr. 1·37), the Oil should retain a light yellow colour, not becoming orange or reddish-brown, and after 6 hours should change into a yellowish-white solid mass and an almost colourless liquid, *U.S.P.*; 1 c.c. of fuming Nitric

Acid, 1 c.c. of Water and 2 c.c. of Oil at 10° C. (50° F.); a greenish-white, but not red or brown mixture is obtained, which separates into a firm white mass and a faintly coloured liquid after from 2 to 6 hours, *P.G.*

Silver Nitrate.—If 5 c.c. of the Oil be shaken with 5 c.c. of a solution of 0·1 gramme of Silver Nitrate in 10 c.c. of Alcohol, with the addition of 2 drops of Nitric Acid, and the mixture heated for about 5 minutes on a water-bath, the Oil should retain its original pale colour, not becoming reddish or brown, nor should any dark colour be produced at the line of contact of the two liquids, *U.S.P.*

Amyl Alcohol.—If 2 c.c. of the Oil be mixed in a test-tube with 2 c.c. of equal volumes of Amyl Alcohol and Carbon Bisulphide containing 1 p.c. of Sulphur in solution, and the test-tube be immersed to one-third or one-half its depth in boiling salt Water, no reddish colour should develop in from 10 to 15 minutes, *U.S.P.*

Hydrochloric Acid with Sugar.—If a mixture of 2 c.c. of Oil and 1 c.c. of Hydrochloric Acid (sp. gr. 1·18) containing 1 p.c. of Sugar be shaken for half a minute and allowed to stand for 5 minutes, then 3 c.c. of Water added and the whole again shaken, the acid layer should not show a pink colour, *U.S.P.*

OLEUM ARACHIS. *Syn.* Earth-Nut, Ground-Nut or Pea-Nut Oil.—The oil expressed from the seeds of *Arachis Hypogæ*; **Oleum Sesami,** the oil expressed from the seeds *Sesamum indicum*; both are official in the *Ind.* and *Col. Add.*, the former for India and the African, Eastern and Australian Colonies, the latter for India and African, Eastern and North American Colonies, in which places they are officially permitted to be used in place of Olive Oil in making liniments, ointments, plasters and soaps.

OPIUM.

OPIUM.

FR., OPIUM DE SMYRNE; GER., OPIUM; ITAL., OPPIO; SPAN., OPIO.

The milky exudation of *Papaver somniferum*, L., obtained by incision from the unripe Capsules, and inspissated by spontaneous evaporation.

Opium in powder should contain between 9½ and 10½ p.c. of anhydrous Morphine.

The Extract and Tincture of Opium being standardised preparations, any suitable variety of Opium may be used in their manufacture, provided that when dry it shall yield when assayed by the official process not less than 7·5 p.c. of anhydrous Morphine. When used in the preparation of the remaining official galenical preparations, Opium is officially required to be of such a strength that the powder obtained from the Opium when dried till constant in weight at 100° C. (212° F.) shall yield not less than 9·5 and not more than 10·5 p.c. of anhydrous Morphine. The *B.P.* also permits the dilution of an Opium of greater alkaloidal strength than official requirements to be diluted with one of a less official strength or with Milk Sugar. The *U.S.P.* requires that Opium shall yield when in its normal moist condition not less than 9 p.c. of cystalline Morphine; the *P.G.* requires that 100 parts of powdered Opium shall contain 10 to 12 parts of anhydrous Morphine, and on drying at 100° C. (212° F.) shall lose not more than 8 p.c. of its weight.

The Opium official in the *Fr. Codex* (1908), when dried at 60° C. (140° F.), is required to contain at least 10 p.c. of Morphine.

Opium Granulatum (Opium dried and in coarse powder), and Opium Deodoratum should yield not less than 12 p.c. nor more than 12·5 p.c. of crystallised Morphine.

Medicinal Properties. As a hypnotic and sedative it is used in insomnia, excitement and delirium of whatever origin, including that of typhoid; as an analgesic to relieve all forms of neuralgic and abdominal pain, the pain of pleurisy, and of gastric ulcer and of cancer, the pain during the passage of biliary and renal calculi, and the after-pains of labour; as a hæmostatic in intestinal and pulmonary hæmorrhage; in diabetes; in full doses for acute peritonitis; in small doses along with other astringents in diarrhœa.

In aortic regurgitation it increases the peripheral blood supply, especially to the brain, it reduces the tendency to syncope, it relieves the angina, and the cardiac dyspnœa, but if the kidneys are affected it should not be given.

As an **expectorant** it is used, guarded by Ammonia, only where the secretion of mucus is abundant, and not thick and viscid or scanty.

As a diaphoretic, in form of Dover's Powder, it is valuable in influenza and coryza.

As an antispasmodic, in puerperal convulsions, epilepsy, colic, severe forms of chorea and spasmodic asthma; in spasmodic urethral stricture.

Locally in the form of **liniment**, **plaster**, or fomentation, it is used in neuralgias, rheumatism, lumbago and sciatica.

To avoid impairment of digestion, and to obtain rapid action, it is given subcutaneously (as hypodermic injection of Morphine) in neuralgia and sciatica, near the seat of pain, also in angina pectoris, cardiac paroxysmal pain, and for the dyspnœa caused by intrathoracic tumours.

In form of Morphine, or Lead and Opium, **suppository** it relieves rectal and genito-urinary and other pelvic pains, and is useful after operations on these regions. Opium is preferable to Morphine in peritonitis, enteritis, and other abdominal inflammations, on account of its direct and more prolonged anodyne and astringent effect, and because of its more continued action it is preferable in delirium and other 'head symptoms.'

Its continued use impairs the appetite, digestion and intellect; that it is a cardiac depressant should always be borne in mind. Great caution should be exercised in giving Opium to infants and young children, as they are very susceptible to its action, and it is contraindicated in the pain of chronic dyspepsia, in cases of coma with contracted pupil, in kidney diseases, in nursing females and plethoric persons, in cerebral hyperæmia, in alcoholic intoxication, and for the control of nausea and vomiting in uræmia; in the advanced stages of bronchitis and pneumonia, or whenever the respiration is seriously embarrassed, it is a most dangerous remedy.

Valuable papers on Morphine in cardiac diseases.—*L.* '98, ii. 1393; and by Burney Yeo, Stockman, etc., on Opium in acute and chronic disease.—*Pr.* '07, i. 625.

Of sugar-reducing drugs, the most to be relied upon. Most useful in severe cases, in which a rigid diet fails.—*Pr.* '07, ii. 148.

A modification of the Bromide treatment of epilepsy is found in the Opium-bromide therapy. One of the preparations of Opium, preferably the Extract, is given (*L.* '05, i. 710) for a period of six weeks in increasing doses up to 15 grains per diem, when it is suddenly stopped and large doses of Bromide salt, from 90 to 120 grains, are substituted, this large dose being gradually diminished until about 30 grains are taken daily.

A useful way of giving Opium consists (*B.M.J.* '05, ii. 1004) in mixing ½ drm. to 1 drm. of Tincture or Liquid Extract with enough Water to bring it up to 2 fl. drm. and inject it into the empty rectum by a Glycerin springe. In half to three-quarters of an hour the Opium is usually absorbed and relieves pain almost more efficiently and for a longer time than a subcutaneous injection does.

Dose.—½ to 2 grains = 0·032 to 0·13 gramme.

Ph. Ger. maximum single dose, 0·15 gramme; maximum daily dose, 0·5 gramme.

Prescribing Notes.—*Powdered Opium can be made into* **pills** *with Alcohol* (60 *p.c.*).

It is convenient to remember that $\frac{1}{10}$ *grain Morphine is contained in* 1 *grain of Powdered Opium, in* ½ *grain of Extract, in* 15 *minims of Liquid Extract or of Tincture, in* 96 *minims of Ammoniated Tincture of Opium, in* 240 *minims of Compound Tincture of Camphor.*

Opium is frequently ordered in lotions, 20 *to* 60 *minims of Liquid Extract or Tincture to the fl. oz. It is also prescribed with Lead Acetate and Lead Subacetate, but the result is a turbid liquid deficient in strength of Lead owing to the precipitation of Lead Meconate; Solution of Morphine Acetate being nearly the same strength as the Tincture, and mixing readily with Lead Lotions without precipitation, can advantageously be employed in its place.*

Incompatibles.—The Alkaline Carbonates, Lime Water, salts of Lead, Iron, Copper, Mercury, and Zinc, Liquor Arsenicalis, and vegetable astringents.

Official Preparations.—Extractum Opii and Tinctura Opii; used in the preparation of Codeine and of Morphine; of the **Powdered Opium,** Emplastrum Opii, Pilula Plumbi cum Opio, Pulvis Cretæ Aromaticus cum Opio, Pulvis Opii Compositus, and Unguentum Gallæ cum Opio. Contained in Pilula Saponis Composita, Pulvis Kino Compositus, Pulvis Ipecacuanhæ Compositus, and Suppositoria Plumbi Composita. Of the **Compound Powder,** Pilula Ipecacuanhæ cum Scilla; of the **Extract,** Extractum Opii Liquidum. Of the **Tincture,** Linimentum Opii and Tinctura Opii Ammoniata; contained in Tinctura Camphoræ Composita.

Not Official.—Acetum, Aqua, Confectio, Enema, Trochiscus, Unguentum, and Vinum, Opii, Solution of Bimeconate of Morphia (Squire), *Syn.* Liquor Meconicus, Meconii Periodidum, Liquor Opii Sedativus, Linctus Opiatus, Linimentum Opii Ammoniatum, Sydenham's Laudanum, Tinctura Opii Crocata, Tinctura Opii Deodorati, Narceina, Narcotina, Papaverina, Cotarnine Hydrochloride, Stypticin, and Styptol.

Antidotes.—In poisoning by Opium the antidotes are, an emetic of 10 grains of Copper Sulphate, the stomach-tube, external stimulants, cold affusion, Ammonia to the nostrils, compelled exertion, and artificial respiration. Belladonna or hypodermic injection of Atropine should be used; Strychnine; Amyl Nitrite; Gelsemium; Potassium Permanganate. *See* also Morphinæ Hydrochloridum.

Foreign Pharmacopœias.—Official in Austr., not less than 12 p.c.; Belg., Dan., Dutch, Hung., Ital., Norw., Port. and Span., not less than 10 p.c.; Mex., 10 p.c.; Ger., Russ., Swed. and Swiss, 10 to 12 p.c.; Fr. and Jap., 10 to 11 p.c.; U.S., not less than 12 p.c.; all calculated on dried Opium.

Descriptive Notes.—The Opium chiefly imported into this country comes from Asia Minor, Greece, and Persia. The Opium from Turkey used in pharmacy is largely that from the districts Karahissar, Boghaditz, and Ghiveh, which latter is often called Constantinople Opium. It occurs in more or less rounded pieces, averaging from ½ to 2 lb. in weight, usually covered with Poppy leaves, with Rumex capsules more or less adherent to the cakes. The Boghaditz is richest in Morphine, but gummy and difficult to assay. The Yerli Opium comes from the country surrounding Smyrna, it is soft and unsightly, and chiefly used in the manufacture of Morphine. Natural Karahissar Opium usually yields 11½ to 12 p.c. of Morphine, it is also used for the manufacture of Morphine; the inferior qualities are known as Adet. Grecian or Salonica Opium, like the two following, is sold as 'shipping' Opium. The best is selected for Cuba, and soft grades are shipped to the United States. It contains from 10 to 14 p.c. of Morphine, and is sold at a high price for smoking. Tokat and Malatia Opiums are produced in Armenia and go chiefly to Cuba, the West Indies, and Central and South America. They average from 7 to 14 p.c. of Morphine. These shipping Opiums are generally in softer and flatter cakes and have, on arrival a greener leaf on their surface. When purchased fresh on the Turkey market an allowance is made for the moisture in Opium and a charge of 2*d.* per lb. is made for drying it. It loses approximately 23 p.c. in the drying warehouses before it is fit for shipment. The Boghaditz, Karahissar and Yerli Opiums vary much in size, shape, and weight, and the Poppy leaves covering them are irregularly placed; in the Ghiveh Opium, on the contrary, two leaves are placed in opposite directions on either side of the bun-shaped cakes. All Turkey Opiums have a granular fracture, and consist of agglomerated tears. Persian Opiums, on the contrary, have a uniform non-granular consistence. The Opiums used in pharmacy, although averaging from 11 to 12 p.c. of Morphine, have of late years, since a uniform standard has become official (10 p.c., *B.P.*), been purposely lowered in Morphine contents. Persian Opium is chiefly re-exported, although it is also used for the manufacture of Morphine, as it averages about 12 p.c. of that alkaloid, whereas that exported direct from Turkey to China averages 9 to 10 p.c., consisting of 80 p.c. of pure juice and 20 p.c. of foreign substances. Persian Opium is prepared in various forms, cones, loaves, rectangular blocks, sticks, etc., and these are packed in coloured paper, vine, or fig leaves, sometimes in 'poppy trash,' but the pieces of each brand are usually of uniform size and weight. The Opium in sticks is used for eating, and contains rarely more than 3 p.c. of Morphine, sometimes only traces. In estimating the value of a chest of Opium, a small portion is taken out of a third of the pieces in the chest, this is beaten into a uniform mass and a small portion of the mass is analysed. The cakes of Opium naturally vary in Morphine contents according to the amount of adulteration with foreign matters and the condition of collection.

Opium is sometimes adulterated with paste made of evaporated grape juice and paste made of dried apricots and inferior gum tragacanth, but such pieces are deficient in elasticity (or 'touch' as the Chinese call it) and break with a short fracture. Particles of Lead added to increase weight have also been found in Opium.

Tests.—The *B.P.* process for the determination of Morphine is a combined gravimetric and volumetric one; the *U.S.P.* is a gravimetric process, the Morphine crystals obtained being purified by re-solution in Lime Water and the amount of insoluble matter deducted from the weight of impure Morphine first obtained. The Morphine crystals so obtained contain the Water of crystallisation and are not anhydrous; the *P.G.* is a volumetric process. The process adopted by the *Fr. Codex* for the determination of the Morphine is the Lime and Ammonium Chloride method, somewhat similar to the *B.P.* The crystals are dried at a temperature of 100° C. (212° F.), and when completely dried (which is stated to require about 2 hours), they are cooled and washed with three successive quantities each of 8 c.c. of Benzene and again dried at 100° C. (212° F.); the yield should not be less than 10 nor more than 11 p.c. The process at present official in the *B.P.* is a modification of that of the *B.P.* 1885; it was originally devised by Portes and Langlois, and with slight alterations was adopted by the Société de Pharmacie of Paris, and was the official process of the *U.S.P.* 1880. It was improved by Conroy (*P.J.* [3] xv. 473) and adopted as the official process in the *B.P.* 1885. It is a Lime process, and differs only in the following essential points from that of the *U.S.P.* 1880: (1) Double the quantities of Opium, Calcium Hydroxide and Ammonium Chloride are employed by the *B.P.*, and therefore double the quantities are used throughout; (2) the anhydrous and not the crystalline Morphine is weighed; (3) a volumetric determination has been added by the *B.P.* for the purpose of determining the quantity of pure alkaloid present. The process is almost a verbatim copy of the *U.S.P.* 1880, which reads as follows: A weighed quantity of 7 grammes of Opium, in any condition to be valued (the *B.P.* directs dried at 100° C. (212° F.) in No. 50 powder), is triturated with 3 grammes of freshly-slaked Lime and 20 c.c. of Distilled Water in a mortar until a uniform mixture results. A measured quantity of 50 c.c. of Distilled Water is then added and the mixture stirred occasionally during half an hour, it is filtered through a plaited filter into a wide-mouth stoppered bottle having a capacity of about 120 c.c., and marked at exactly 50 c.c. The *B.P.* makes an allowance for the soluble matters contained in the Opium, and requires the bottle to be marked at 104 c.c., and the corresponding mark on the bottle would therefore be 52 c.c. A measured quantity of 50 c.c. of the filtrate (*B.P.* quantities correspond to 52 c.c.), is collected, representing 5 grammes of Opium, 5 c.c. of Alcohol (94 p.c.) and 25 c.c. of Ether added and the mixture shaken; a weighed quantity of 3 grammes of Ammonium Chloride is added and the mixture well and frequently shaken during half an hour, and then set aside for 12 hours to allow the crystallisation of the Morphine. Counterbalance 2 small filters, place one within the other in a small funnel, and decant the ethereal layer as completely as practicable upon the filter. The *B.P.* inserts instructions as to how the filter papers are to be placed in the funnel, the triple fold of one paper being superimposed upon the single fold of the other. A measured quantity of 10 c.c. of Ether is added to the contents of the bottle, which is rotated, and the ethereal layer is again decanted upon the filter, the latter being washed with 5 c.c. of Ether added slowly and in portions, the filter is now allowed to dry in the air and the liquid in the bottle poured upon it in portions in such a way as to transfer the greater part of the crystals to the filter. The bottle is washed and the remaining crystals are transferred with several small portions of Distilled Water, using not much more than 10 c.c. in all and distributing the portions evenly upon the filter. The *B.P.* employs Morphinated Water for washing out the bottles and for washing the crystals on the filter. The Morphinated Water consists of a saturated solution of Morphine in Chloroform Water, and is prepared by digesting an excess of pure Morphine with Chloroform Water for 7 days at a temperature of 15·5° C. (60° F.). The filter is allowed to drain and dry, first by pressing it between sheets of bibulous paper, afterwards at a temperature between 55° and 60° C. (131° to 140° F.), this yields the Morphine as a crystalline product containing 1 molecule of Water of crystallisation, the *B.P.* removes this molecule of Water of crystallisation by further drying for 2 hours at a temperature of 110° C. (230° F.), and weighs the Morphine in the anhydrous condition, making an allowance of 0·104 of a gramme for each 104 c.c. for the solubility of Morphine in the menstruum used. Inasmuch as the *B.P.* process is carried out on twice the quantity recommended by the *U.S.P.* 1880 the weight of anhydrous Morphine obtained plus the solubility allowance of 0·104 of a gramme multiplied by 10 yields the percentage of impure Morphine present in the sample. The *B.P.* then directs the determination of the amount of pure alkaloid present by the following volumetric method: A weighed quantity of 0·5 gramme of the crystals is titrated with Tenth-normal Volumetric Sulphuric Acid Solution, the titration being officially directed to be continued until the liquid, after boiling, slightly reddens blue Litmus paper. 1 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution represents 0·0283 gramme of pure anhydrous Morphine. If the number of c.c. of Tenth-normal Volumetric Sulphuric Acid Solution used be multiplied by 0·0283 the product will be the weight of pure anhydrous Morphine present in the 0·5 gramme of the crystals operated on. From this weight the amount of pure anhydrous Morphine present in the total weight of crystals obtained in the gravimetric process may be calculated, and the resultant weight of pure anhydrous Morphine, plus 0·104 of a gramme (solubility allowance), indicates the amount of pure anhydrous Morphine present in 10 grammes of the Opium, which should amount to not less than 0·95 of a gramme, and not more than 1·05 grammes, corresponding to not less than 9·5 nor more than 10·5 p.c. of pure anhydrous Morphine in the dry, powdered Opium. The volumetric portion of the Pharmacopœia process is not very happy. It is better to dissolve a given weight of the crystals in an excess of Tenth-normal Volumetric Sulphuric Acid Solution and to titrate the excess of Tenth-normal Volumetric Acid Solution with Tenth-normal Volumetric Potassium or Sodium Hydroxide Solution, and to use

Methyl Orange Solution in the place of blue Litmus paper as an indicator of neutrality. The part of the test relating to the titration is not very clearly worded, one does not add 'to the weight of anhydrous Morphine indicated by the titration, but to the total weight of the crystals in the filter, afforded by the titration figure.'

The following method of assay is recommended by Dott:—A weighed quantity of 10 grammes of powdered Opium is digested with 25 c.c. of Water, 1·8 grammes of Barium Chloride dissolved in about 12 c.c. of Water is added, the solution made up to 50 c.c., well mixed and after a short time filtered. A measured quantity of 25 c.c. (= 5 grammes of Opium) is mixed with diluted Sulphuric Acid, just enough to precipitate the Barium, about 1 c.c. is required, and the solution should be warmed to cause the precipitate to subside, and the solution to filter clear. To the filtered solution about 0·5 c.c. of dilute Ammonia Solution is added, sufficient to neutralise the free acid, and the solution concentrated to 6 or 7 c.c. and allowed to cool. 1 c.c. of Alcohol (90 p.c.) and 1 c.c. of Ether is added and Ammonia Solution in slight excess; the Ammonia Solution being added gradually until there is no further precipitation and a perceptible odour of Ammonia remains after well stirring, breaking down any lumps with a stirring-rod. After 3 hours the precipitate is collected on counterpoised filters and washed. It should be noticed that the solution has a faint odour of Ammonia, if not, 1 or 2 drops of Ammonia Solution should be added. The dried precipitate is washed with Benzene or Chloroform, dried and weighed. It is then titrated with Tenth-normal Volumetric Sulphuric Acid Solution until the Morphine is neutralised as indicated by the solution reddening blue Litmus paper. 1 c.c. of Tenth-normal Sulphuric Acid Solution equals 0·0303 gramme of hydrated Morphine, equivalent to 0·0283 gramme of anhydrous Morphine.

The *U.S.P.* process is practically on the following lines:—A weighed quantity of 10 grammes of Opium in any condition to be valued is introduced into an Erlenmeyer flask together with 100 c.c. of Water and the mixture shaken for 10 minutes during 3 hours, the contents are poured on to a wetted filter and when the liquid is drained off, the residue is carefully washed with Water until 150 c.c. of the filtrate have been obtained, the Water being dropped upon the edges of the filter and its contents. The residual Opium is re-transferred to the flask, 50 c.c. of Water added, the agitation repeated during 15 minutes and again filtered. The residue is washed as before until a second 150 c.c. have been collected. The filtrates are evaporated down in rotation in a tared dish, the containing vessels being rinsed out with a third filtrate and the evaporation continued until the residue is reduced to a weight of 14 grammes. After dissolving in the fluid any extract which may have dried on the sides of the basin, it is transferred to a tared Erlenmeyer flask of the capacity of about 100 c.c., the dish rinsed with a few drops of Water and the washings transferred to the flask until the mixed solution and washings weigh 20 grammes. 10 grammes of Alcohol (94·9 p.c.) are added, the flask well shaken and 25 c.c. of Ether added, the flask again shaken; 3·5 c.c. of Ammonia Solution are now added from a graduated pipette or burette, the flask stoppered and shaken thoroughly during 10 minutes and set aside in a moderately cool place for at least sixteen hours. The ethereal solution is decanted as completely as possible on to two small counterpoised filters contained in a glass funnel in such a way that the triple fold of the inner filter is laid against the single fold of the outer filter, both being previously moistened with Ether. The contents of the flask are washed with 10 c.c. of Ether, which is also decanted on to the filter, the operation being completed with a further quantity of 10 c.c. of Ether; the filter paper is then dried, and the aqueous contents of the flask are then transferred to the filter, the crystals of Morphine, and the aqueous contents of the bottle are transferred to the filter, the remaining crystals being removed from the flask with Water, using not more than 15 c.c. in all. The filter is allowed to drain, washed with Alcohol (94·9 p.c.) previously saturated with powdered Morphine, and finally with Ether, using about 10 c.c. or more if necessary. The filter is allowed to dry at a temperature not exceeding 60° C. (140° F.) until its weight remains constant, transferred to a tared watch-glass and weighed. The crystals are placed in an Erlenmeyer flask together with 10 c.c. of Lime Water for each 0·1 of a gramme of Morphine and the mixture shaken at intervals during 30 minutes. The liquid is passed through two filter papers folded so that the triple fold of the inner filter paper is superimposed against the outer filter paper, the flask rinsed with Lime Water and the washings passed through the filter until the filtrate, after acidification, no longer yields a precipitate with Mercuric Potassium Iodide (Mayer's) Solution; the filters are pressed between folds of bibulous paper until nearly dry, and dried to a constant weight. The weight of the insoluble matter on the filter deducted from the weight of Morphine crystals previously found, and the difference multiplied by 10, represents the percentage of crystallised Morphine contained in the Opium.

The *P.G.* method of determination is as follows:—A weighed quantity of 6 grammes of Opium in a state of middling fine powder is triturated with 6 grammes of Water and the mixture transferred to a dry tared flask and the contents brought to a weight of 54 grammes by the addition of a further quantity of Water. After the mixture has been allowed to stand for 1 hour with intervals of vigorous shaking, the mass is pressed through a piece of dry calico, 42 grammes of the pressed fluid filtered through a dry filter paper into a dry flask, 2 grammes of a 1 in 2 w/w Sodium Salicylate Solution added and the whole vigorously shaken. A weighed quantity of 36 grammes of the clear fluid is then filtered through a dry filter into a flask, the filtrate is rotated with 10 grammes of Ether and mixed with 5 grammes of a mixture of 17 grammes of Ammonia Solution and 83 grammes of Water; the flask is then closely stoppered, the contents shaken vigorously for 10 minutes and allowed to remain at least for 24 hours. The ethereal liquid is then completely transferred to a plaited filter, the aqueous liquid remaining in the flask is washed with 10 grammes of Ether, the mixture allowed to remain a few seconds and then transferred again to the filter. After the separation of the ethereal liquid the aqueous solution is transferred through the same filter together with the crystalline residue. The filter as well as the flask is washed 3 times with successive quantities of 5 grammes of Water saturated with Ether; after the flask has been thoroughly washed out and the filter has been completely drained, the Morphine crystals, after drying, are dissolved in 25 c.c. of Tenth-normal Volumetric Hydrochloric Acid, the solution is transferred to a flask of 100 c.c. capacity, the filter and flask washed with Water and the solution diluted to 100 c.c. A measured quantity of 50 c.c. of this solution is transferred to a stoppered flask of about 200 c.c. capacity, 50 c.c. of Water added, and sufficient Ether added to form a layer of about 1 cm., and the excess of Tenth-normal Volumetric Hydrochloric Acid Solution is titrated with Tenth-normal Volumetric Potassium Hydroxide Solution, using 5 drops of Iodeosin Solution as an indicator of neutrality, shaking the solution after each addition. Not more than 5·4 c.c. and not less than 4·1 c.c. of the Tenth-normal Volumetric Potassium Hydroxide Solution should be required. The number of c.c. of Tenth-normal Volumetric Potassium Hydroxide Solution required multiplied by 2, the product subtracted from 25, the difference multiplied by 0·0285 yields the weight of anhydrous Morphine present in 4 grammes of the Opium, and if this figure be again multiplied by 25 will yield the percentage by weight of anhydrous Morphine present in the sample.

Preparations.

EMPLASTRUM OPII. OPIUM PLASTER.

Opium in very fine powder, 1; Resin Plaster, 9. (1 in 10)

Anodyne to relieve local pain.

Foreign Pharmacopœias.—Official in Mex., 1 Opium in 20; Fr., 1 Extract in 4; Port., 1 Extract in 10; U.S., 6 Extract in 100. Not in the others.

EXTRACTUM OPII. EXTRACT OF OPIUM.

An Aqueous Extract containing 20 p.c. of Morphine.

Dose.—¼ to 1 grain = 0·016 to 0·065 gramme.

Ph. Ger. maximum single dose, 0·15 gramme; maximum daily dose, 0·5 gramme.

The *B.P.* and *U.S.P.* both require the Extract to contain 20 p.c. of Morphine, the *P.G.* Extract is required to yield from 15 to 20 p.c. of Morphine.

The Extract of Opium official in the *Fr. Codex* (1908) is required to contain exactly 20 p.c. of Morphine, which is in accordance with the recommendation of the *Brussels Conference*.

The *Brussels Conference* agreed to a content of 20 p.c. of Morphine in the extract.

It is officially permitted to mix stronger and weaker Extracts in order to obtain extract of Opium of proper strength and consistence. An Extract of Opium stronger than the official requirements may be diluted with a sufficiency of Distilled Water or with Milk Sugar. In the first issue of the *B.P.* '85 the Extract was directed to be made from Opium in powder and restricted in the official variety, but the criticism evoked was so strong that in the later reprints it was permitted to use any variety of Opium as long as the product conformed to the official standard of Morphine.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S. Not in Dan.

The International Standard is 20 p.c. of Morphine. Austr., Belg., Dutch, Fr., Mex., Span., Swiss and U.S. all 20 p.c. of Morphine. Ger., 15 to 20 p.c. Jap., 16 to 17·5 p.c. Ital., 15 p.c. Swed., 17 to 20 p.c. The remainder do not give percentage.

Tests.—Extract of Opium is assayed according to the process described under Opium; a weighed quantity of 7 grammes of the Extract being used in place of the 14 grammes of powdered Opium there employed. The *U.S.P.* employs the following process for the assay of the Extract:—A weighed quantity of 4 grammes is dissolved in 30 c.c. of Water, the solution filtered, the filter and residue washed with Water until all soluble matter is extracted, the washings being separately collected. They are evaporated in a tared dish to a weight of 10 grammes. When completely dissolved the Extract is poured into a tared Erlenmeyer flask of about 100 c.c. capacity, the dish rinsed with a few drops of Water until the total weight of the solution amounts to 15 grammes, a weighed quantity of 7 grammes of Alcohol (94·9 p.c.) is added, the flask well shaken and 20 c.c. of Ether added, the shaking being repeated. 2·2 c.c. of Ammonia Water is added from a pipette, the flask stoppered and thoroughly shaken for 10 minutes and set aside for 6 hours or over night. The Ether solution is then filtered through two counterpoised filter papers, the filter papers being placed in the funnel in such a manner that the triple fold of the inner filter is superposed on the single fold of the outer filter, and the papers are previously moistened with Ether. The contents of the flask are washed with 15 c.c. of Ether, which Ether solution is again decanted on the filter, the washing is repeated with a further portion of 15 c.c. of Ether, the aqueous liquids in the flask are transferred to the filter together with the crystals of Morphine, the crystals remaining in the flask being transferred by washing with several portions of Water, using a total quantity of not more than 10 c.c. The filter is allowed to drain, the crystals being washed free from the mother liquor first with Water and afterwards with (94·9 p.c.) Alcohol (saturated with Morphine), and finally with Ether, using about 10 c.c. or more if necessary. The filter is allowed to dry at a temperature not exceeding 60° C. (140° F.) until constant in weight, the crystals of Morphine carefully transferred to a watch-glass and weighed; they are then transferred to an Erlenmeyer flask, and Lime Water in the proportion of 10 c.c. for each 0·1 of a gramme of Morphine added, the flask being shaken at intervals for 25 minutes, the filter placed in a funnel in such a way that the triple fold of the inner filter is laid against the single fold of the outer filter; the flask is rinsed with Lime Water passing the washings through the filter until the filtrate after being acidified will no longer yield a precipitate with Mercuric Potassium Iodide (Mayer's) Solution. The filters are pressed between folds of bibulous paper, dried to a constant weight and weighed. The weight of insoluble matter on the filter is subtracted from the weight of the impure Morphine crystals found above, the difference multiplied by 5 yields the percentage of pure crystalline Morphine present in the Extract of Opium.

The German Pharmacopœia employs the following method for the determination of Morphine in the Extract: A weighed quantity of 3 grammes is dissolved in 40 grammes of Water, 2 grammes of a 1 in 2 w/w solution of Sodium Salicylate added to the solution and 30 grammes of the clear liquid filtered through a dry filter into a dry flask. The filtrate is mixed with 10 grammes of Ether and 5 grammes of a mixture of 17 grammes of Ammonia Solution and 83 grammes of Water, the flask is stoppered, the contents shaken vigorously for 10 minutes and allowed to remain at rest for 24 hours. The ethereal liquid is then filtered through a counterpoised filter, the aqueous fluid remaining in the flask is washed with 10 grammes of Ether and the ethereal liquid passed through the same filter. The aqueous solution is then passed through the filter without removing the residue which is crystallised on the sides of the flask, the flask is washed with 3 successive quantities of Water saturated with Ether. After it has been well washed and the filter is completely drained, the Morphine crystals, after drying, are dissolved in 25 cc. of Tenth-normal Volumetric Hydrochloric Acid, the solution transferred to a flask of 100 c.c. capacity, the filter and the flask washed thoroughly with Water, and the filtrate and washings finally diluted to 100 c.c. A measured quantity of 50 c.c. of this solution is mixed in a stoppered flask of about 200 c.c. capacity with 50 c.c. of Water and sufficient Ether to form a layer of about 1 cm. The excess of acid is titrated with Tenth-normal Volumetric Potassium Hydroxide Solution, using 5 drops of Iodeosin Solution as an indicator of neutrality. Not more than 6·5 c.c. and not less than 5·5 c.c. of the tenth-normal volumetric alkali solution should be necessary to neutralise the excess of acid. The number of c.c. of Tenth-normal Volumetric Potassium Hydroxide Solution required is multiplied by 2, the product subtracted from 25, the difference is multiplied by 0·0285, and this product multiplied by 100 and divided by 2·25 yields the percentage by weight of anhydrous Morphine in the extract.

EXTRACTUM OPII LIQUIDUM. Liquid Extract of Opium.
Extract of Opium, $\frac{3}{4}$; Distilled Water, 16; Alcohol (90 p.c.), 4.

Contains 1 grain of Extract = $\frac{1}{5}$ grain Morphine, in 29 minims.

Dose.—5 to 30 minims = 0·3 to 1·8 c.c.

Not in the foreign Pharmacopœias.

The *B.P.* Liquid Extract of Opium is required to contain 0·75 p.c. w/v of anhydrous Morphine; a Fluid Extract is not official in either the *U.S.P.* or *P.G.*

Tests.—Liquid Extract of Opium has a sp. gr. of 0·985 to 0·990; it contains about 3 p.c. w/v of total solids; and about 18 p.c. w/v of Absolute Alcohol. It is officially required to contain not less than 0·7 p.c. w/v nor more than 0·8 p.c. w/v of anhydrous Morphine as determined by a similar process to that adopted for the determination of the alkaloid in the Tincture (*see* Tinctura Opii).

LINIMENTUM OPII. Liniment of Opium.
Tincture of Opium, 1; Liniment of Soap, 1. (1 in 2)

The addition of the Opium to the Soap Liniment renders it more useful in many cases of rheumatism and local pains.

Official in Span., Tintura Alcoholica de Opio Jabonosa.

PILULA SAPONIS COMPOSITA. Compound Pill of Soap.
Opium, in powder, 1; Hard Soap, in powder, 3; Syrup of Glucose (by weight), 1. (1 of Powdered Opium in 5)

Dose.—2 to 4 grains = 0·13 to 0.26 gramme.

Foreign Pharmacopœias.—Official in Fr., 1 Extract in 10; Dan. (Pilulas Cynoglossi), about 1 in 7; Norw., 1 Opium in 7½; Span., 1 Extract in 10; Port. (Pilulas de Opio Comp.), 1 Extract in 10; U.S. (Pilula Opii), Powdered Opium 6½, Soap 2; Mex. has Pildoras pacificas, each containing ·02 gramme of Opium with other ingredients. Not in the others.

PULVIS OPII COMPOSITUS. Compound Powder of Opium.
Opium, 3; Black Pepper, 4; Ginger, 10; Caraway Fruit, 12; Tragacanth, 1. (1 of Powdered Opium in 10)

1 of this powder with 3 of Syrup forms **Confectio Opii,** *B.P.* '85.

Dose.—2 to 10 grains = 0·13 to 0·65 gramme.

TINCTURA OPII. Tincture of Opium. *B.P.Syn.*—Laudanum. *N.O.Syn.*—Tinctura Thebaica.
Opium treated with equal volumes of Distilled Water and Alcohol (90 p.c.), and standardised to contain 0·75 gramme of anhydrous Morphine in 100 c.c.

Contains ⅓ grain Morphine in 29 minims.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c., for repeated administration; for a single administration, 20 to 30 minims = 1·2 to 1·8 c.c.

Ph. Ger. maximum single dose, 1·5 gramme; maximum daily dose, 5·0 grammes.

The *B.P.* Tincture of Opium is required to yield 0·75 p.c. w/v of anhydrous Morphine. The *U.S.P.* Tincture is required to contain not less than 1·2 p.c. w/v nor more than 1·25 p.c. w/v of crystallisable Morphine. The Tincture of the German Pharmacopœia is required to yield 1 to 1·2 p.c. w/v of anhydrous Morphine.

The *Brussels Conference* fixed the strength of the Tincture at 10 p.c. of Opium, and Alcohol (70 p.c.) as a menstruum for the preparation of the Tincture, that it shall be prepared by percolation, and that the strength in Morphine should be 1 p.c. w/w. The Tincture of Opium official in the *Fr. Codex* conforms to these requirements; but it is made from the standardised Extract.

This preparation is stated officially to contain the soluble matter of 32·8 grains of Opium (containing 10 p.c. of anhydrous Morphine) in 1 fl. oz. or about 1 grain of such Opium in 15 minims.

Provided that the Opium does not contain less than 7·5 p.c. of Morphine calculated as anhydrous, any variety is officially allowed for the preparation of the Tincture, it being also stipulated that the resultant tincture should correspond to the quantitative test given above.

B.P. '85 ordered a definite quantity of Opium containing about 10 p.c. of Morphine; only about three-quarters of the Morphine was extracted from the Tincture, but the figure for Morphine was fixed on a different assumption. This difficulty is now removed by fixing a standard for the Morphine content of the Tincture irrespective of the quantity of Opium employed.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Ger., Hung., Ital., Jap., Norw., Russ., Swed., Swiss and U.S., 1 (powder) in 10; Mex., 1 in 8; Fr., Port. and Span., 1 Extract in 20. All by weight, except U.S. U.S. has also Tinctura Opii Decolorati.

The *Brussels Conference* agreed to a strength of 10 p.c. of Opium, 1 p.c. of Morphine; using Alcohol (70 p.c.).

The *Fr. Codex* contains 5 p.c. w/w of Extract of Opium, corresponding to about 10 p.c. of Opium dried at 60° C. (140° F.); it is prepared with 70 p.c. Alcohol in accordance with the recommendation of the *Brussels Conference.*

Tests.—Tincture of Opium has a sp. gr. of 0·950 to 0·960; it contains about 3·5 p.c. w/v of total solids and about 43 to 44 p.c. w/v of Absolute Alcohol. It is officially required to yield not less than 0·7 p.c. w/v nor more than 0·8 p.c. w/v of anhydrous Morphine as determined by evaporating a measured quantity of 80 c.c. of the Tincture to about $\frac{3}{8}$th its volume, adding 3 grammes of freshly slaked Lime, and thoroughly mixing and diluting the mixture with Water to 85 c.c. It is then set aside, with intervals of occasional shaking, for 30 minutes. A measured quantity of 50 c.c. (= 50 c.c. Tincture) is filtered into a wide-mouthed, stoppered bottle, 5 c.c. of Alcohol (90 p.c.) and 30 c.c. of Ether added, and the mixture shaken; 2 grammes of Ammonium Chloride is then added, and the mixture frequently and vigorously shaken during 30 minutes, and finally set aside for 12 hours to allow the Morphine to crystallise. The ethereal liquid is then suitably transferred to two small counterpoised filter papers contained in a funnel in such a way that the triple fold of the one filter shall be laid upon the single fold of the other filter paper. The transference is preferably not made in a pipette as recommended in the *B.P.*, which is clumsy and apt to result in loss of alkaloid. The aqueous liquid in the bottle is washed by shaking with 15 c.c. of Ether, which ethereal solution is passed through the same filter paper, and the filter is finally washed with 10 c.c. of Ether. After the filter has been allowed to dry, the aqueous liquid is filtered through the same filter paper, the crystals being transferred to the filter, first by means of small successive quantities of the filtrate, and the last traces of crystals are transferred from the bottle by washing with Morphinated Water; the crystals on the filter are washed with Morphinated Water until the washings are colourless; dried first by pressure between folds of bibulous paper, subsequently at a temperature not exceeding 60° C. (140° F.), and finally are rendered anhydrous by drying at 110° C. for 2 hours, cooled and weighed. The solubility allowance recommended by the

B.P. is of 0·05 of a gramme or 0·1 of a gramme for every 100 c.c. of the original filtrate, and this figure must be added to the weight of crystals obtained in the gravimetric determination, the product multiplied by 2, indicates the percentage w/v of anhydrous Morphine present in the Tincture. A weighed quantity of 0·3 gramme of the crystals is titrated with Tenth-normal Volumetric Sulphuric Acid Solution in the same manner as directed for the crystals obtained in the Opium determination. The number of c.c. Tenth-normal Volumetric Sulphuric Acid Solution required, multiplied by 0·0283, represents the amount of pure anhydrous Morphine present in 0·3 of a gramme of the crystals worked upon; from this the weight of pure anhydrous Morphine present in the total amount of crystals obtained in the determination may be calculated; to the weight of pure anhydrous Morphine thus obtained, is added 0·05 of a gramme or 0·1 of a gramme for every 100 c.c. of the original filtrate and the product multiplied by 2 yields the percentage w/v of pure anhydrous Morphine present in the Tincture.

The *U.S.P.* method of assay is to evaporate 100 c.c. of the Tincture to about one-fifth of its volume, add 40 c.c. of Water and mix thoroughly; set aside the mixture for 1 hour, stirring occasionally during the interval to disintegrate the resinous flakes adhering to the dish. It is then filtered, the residue washed with Water until all the soluble matter is extracted, and the filtrate and washings evaporated in a tared dish to a weight of 14 grammes, which is then assayed according to the process described under Opium. In calculating the results the final multiplication by 10 is omitted, as the 14 grammes worked upon represents 100 c.c. of the Tincture.

The *P.G.* evaporates 50 grammes in a weighed porcelain dish to 15 grammes, dilutes with Water to a weight of 38 grammes, adds 2 grammes of a 1 in 2 w/w solution of Sodium Salicylate, and after vigorous shaking filters 32 grammes of the clear fluid through a dry filter paper into a dry flask. The filtrate is shaken with 10 grammes of Ether, 5 grammes of a mixture of 17 grammes of Ammonia Solution and 83 grammes of Water added; the flask is stoppered and the contents vigorously shaken for 10 minutes and allowed to remain at rest for 24 hours. The ethereal layer is then completely separated, passed through a counterpoised filter, the aqueous solution remaining in the flask washed with 10 grammes of Ether, and this ethereal liquid again passed through the filter. After the complete separation of the ethereal fluid, the aqueous solution is passed through the same filter without disturbing the crystalline residue which is attached to the sides of the flask. The filter and flask are washed with 3 successive quantities each of 5 grammes of Water saturated with Ether, and after the flask has been well washed the filter is completely drained. The Morphine crystals, after drying, are dissolved in 25 c.c. of Tenth-normal Volumetric Hydrochloric Acid, the solution transferred to a flask of 100 c.c. capacity. The filter and flask washed with Water and the solution diluted to 100 c.c., a measured quantity of 50 c.c. of this solution is transferred to a stoppered flask of about 200 c.c. capacity, 50 c.c. of Water added and sufficient Ether to form a layer of about 1 cm. The excess of Tenth-normal Volumetric Sulphuric Acid Solution is titrated with Tenth-normal Volumetric Potassium Hydroxide Solution, using 5 drops of Iodeosin Solution as an indicator of neutrality. After each addition the mixture is vigorously shaken, not more than 5·5 c.c. and not less than 4·2 c.c. of Tenth-normal Volumetric Alkali Solution shall be required. The number of c.c. of Tenth-normal Volumetric Alkali Solution required should be multiplied by 2, the product subtracted from 25, the difference multiplied by 0·0285, and the product again multiplied by 100 and divided by 40 yields the percentage w/v of anhydrous Morphine present in the Tincture.

TINCTURA OPII AMMONIATA. Ammoniated Tincture of Opium. Scotch Paregoric.

Tincture of Opium, 3 fl. oz.; Benzoic Acid, 180 grains; Oil of Anise, 1 fl. drm.; Solution of Ammonia, 4 fl. oz.; Alcohol (90 p.c.), *q.s.* to yield 20 fl. oz.

Tincture of Opium is now used instead of Powdered Opium, Saffron is omitted, and Liquor Ammoniæ Fortis replaced by Liquor Ammoniæ.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Contains $\frac{1}{30}$ grain Morphine in 32 minims.

TINCTURA OPII BENZOICA.—*See* Tinctura Camphoræ Composita.

Other preparations containing Opium:—

	Proportion of Opium.
Pilula Ipecacuanhæ cum Scilla	about 1 in 20
Pilula Plumbi cum Opio	1 in 8
Pulvis Cretæ Aromaticus cum Opio	1 in 40
Pulvis Ipecacuanhæ Compositus	1 in 10
Pulvis Kino Compositus	1 in 20
Suppositoria Plumbi Composita	1 grain in each
Tinctura Camphoræ Composita	¼ grain in 1 fl. drm.
Unguentum Gallæ cum Opio	1 in 13½

	Proportion of Morphine salt.
Injectio Morphinæ Hypodermica	1 in 20
Liquor Morphinæ Acetatis	1 in 100
Liquor Morphinæ Hydrochloridi	1 in 100
Liquor Morphinæ Tartratis	1 in 100
Suppositoria Morphinæ	¼ grain in each
Tinctura Chloroformi et Morphinæ Composita	1 in 100
Trochiscus Morphinæ	$\frac{1}{36}$ grain in each
Trochiscus Morphinæ et Ipecacuanhæ	$\frac{1}{36}$ grain in each

Not Official.

AQUA OPII.—Opium, in powder, 1; Water, 12; distil 6.
Occasionally employed in eye lotions. Aqua Opii, 1; Aqua Sambuci, 7.

ACETUM OPII.—Powdered Opium, 10; Myristica, in No. 30 powder, 3; Sugar, 20; Diluted Acetic Acid, *q.s.* to make 100.—*U.S.P.*

Average Dose.—8 minims = 0·5 c.c.
Acetum Opii, *B.P.C.*, nearly corresponds to the above, the difference being in the Diluted Acetic Acid, which is stronger in the *U.S.P.* than in the *B.P.*

CONFECTIO OPII.—Compound Powder of Opium, 1; Syrup (by weight), 3. *B.P.* 1885.

This has been incorporated in the *B.P.C.*

ENEMA OPII.—Tincture of Opium, 10 to 40 minims; Mucilage of Starch, 2 to 4 fl. oz.—*St. Thomas's.*

Tincture of Opium, 3; Mucilage of Starch, *q.s.* to make 100.—*B.P.C.*

The quantity sufficient for one application is 2 fl. oz., which should be administered warm.—*B.P.C.*

LINCTUS OPIATUS.—Tincture of Opium, 2 minims; Oxymel of Squill, 15 minims; Mucilage of Tragacanth, 15 minims; Glycerin, 15 minims; Emulsion of Chloroform, 3 minims; Syrup, to 1 fl. drm.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

LINIMENTUM OPII AMMONIATUM.—Liniment of Soap, 6; Compound Camphor Liniment, 6; Tincture of Opium, 6; Liniment of Belladonna, 1: Stronger Solution of Ammonia, 1; mix, and after standing a week, filter quickly. —*B.P.C. Formulary* 1901, now incorporated in the *B.P.C.*

LIQUOR MORPHINÆ BIMECONATIS (*Squire*). *Syn.* **Liquor Meconicus.**—A purified Solution of Opium (introduced by Peter Squire in 1839), containing the whole of the alkaloids in their natural state of combination. It is now standardised to contain 1 p.c. of Morphine. The volatile and extractive matters, to which the unpleasant secondary effects of Opium have been attributed, are removed in the process of its manufacture.

The Solution of the same name inserted in the *B.P.* of 1885, though obviously intended to take its place, differed so widely from the original in its properties and method of preparation, that it was no substitute for it, and was deleted in 1898.

Dose.—5 to 30 minims = 0·3 to 1·8 c.c.

LIQUOR OPII SEDATIVUS (*Battley*) has enjoyed a reputation for a long time as an anodyne and sedative superior to Tincture of Opium, but it is somewhat stronger.

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

Liquor Opii Sedativus.—Opium (10 p.c.), 2 oz.; Calcium Hydrate, 2 drm.; Alcohol (90 p.c.), 4 oz.; Sherry, 3 oz.; Water, *q.s.* Boil the Opium (broken into small pieces) and Lime in 15 oz. of Water for half an hour, and allow to cool. Make up to 13 oz. with Water; add the Alcohol and Sherry. Filter, press the marc, add the expressed liquid filtered, and to this add **Proof Spirit** to make 20 fl. oz. Set aside for 6 months to mature; filter. By allowing it to stand for the time mentioned the flavour and aroma are greatly improved.—*A.Ph.F.*

Opium, in small pieces, 10; Calcium Hydroxide, 1·50; Alcohol, 20; Sherry, 15: Distilled Water, *q.s.*; Alcohol (60 p.c.), *q.s.* to produce 100.—*B.P.C.*

MECONII PERIODIDUM.—A preparation representing the alkaloids of the above preparation in combination with excess of Iodine, on the lines of the other Di-iodo-hydriodides.

Dose.—⅛ to ½ grain = 0·008 to 0·032 gramme.

TINCTURA OPII CROCATA (Sydenham's Laudanum).—Contains Saffron, and occurs in the majority of the foreign Pharmacopœias. The *Brussels Conference* agreed to a strength of 1 p.c. w/w of Morphine.

All the preparations are by weight, except *B.P.C.*

Austr.—Opium 10, Saffron 2, Alcohol (68 p.c.) 40, Cinnamon Water 60.

Dutch.—Opium 60, Saffron, 20, Cinnamon 5, Cloves 5, Alcohol 250, Water 250. Macerate for 8 days, express, filter, and, if necessary, dilute to contain 1 p.c. of Morphine.

Hung.—Opium 15, Saffron 15, Cinnamon Water 150.

Ger.—Opium 15, Saffron 5, Cloves 1, Cassia 1, Alcohol (68 p.c.) 70, Water 70.

Russ.—Opium 15, Saffron 5, Cloves 1, Cassia 1, Alcohol (70 p.c.) 75, Water 75.

Swiss.—Opium 10, Saffron 3, Cloves 1, Cassia 1, Alcohol (68 p.c.) 94.

Opium 5, Cinnamon Bark 1, Cloves 1, Saffron 5, Detannated Sherry, *q.s.* to produce 100.—*B.P.C.*

Laudanum Sydenhami.

Belg.—Extract of Opium 50, Tincture of Saffron 150, Oil of Cinnamon 1, Eugenol 1, Alcohol (70 p.c.) 798.

Laudano de Sydenham.

Mex.—Opium 10, Saffron 5, Oil of Cinnamon 16 drops, Oil of Cloves 16 drops, Crystallisable Acetic Acid 0·8, Alcohol (30 p.c.) 80.

Laudanum de Sydenham.

Fr.—Opium 100, Saffron 50, Oil of Cloves 1, Oil of Cinnamon 1, Alcohol 30 p.c. 1000.

It is required to 1 p.c. of Morphine in conformity with the recommendation of the *Brussels Conference.*

Vinum Opii.

U.S.—Opium 10, Cassia 1, Cloves 1, Alcohol 15, White Wine to measure 100.

Vinum Opii Aromaticum.

Jap.—Saffron 1, Cloves 1, Cinnamon 1, Dilute Spirit 7, Sherry 85, Opium 1.

Vinum Opii Crocatum.

Norw.—Opium 15, Saffron 5, Cloves 1, Cinnamon 1, Malaga Wine 150.

Swed.—Opium 15, Saffron 5, Cloves 1, Cinnamon 1, Marsala Wine 150.

Vinho de Opio Composto.

Port.—Extract of Opium 5, Saffron 3, Cloves 1, Cinnamon 1, Madeira Wine 100.

Vino de Opio Compuesto.

Span.—Opium 10, Saffron 5, Cloves 1, Cinnamon 1, White Wine to 100.

Laudano Vino Oppiato Composto.

Ital.—Opium 16, Saffron 8, Cinnamon 1, Cloves 1, Alcohol (60 p.c.) 70, Water 70.

Tinctura Thebaicum Crocatum.

Dan.—Opium 100, Saffron 25, Cloves 6, Cinnamon 6, Alcohol (68 p.c.) to 1000.

TINCTURA OPII DEODORATI.—Granulated Opium (containing 12 to 12·5 of Crystallisable Morphine), 10; Purified Petroleum Benzin, 7·5; Alcohol (95 p.c.), 20; Water, *q.s.* to produce 100. Heat 50 of Water to boiling and pour it on the Granulated Opium contained in a suitable vessel, stirring the mixture frequently during 24 hours. Transfer to a percolator, return the first portion of the percolate until it runs through clear, and when the liquid ceases to drop continue the percolation with Water until the Opium is exhausted. Concentrate the percolate on a water-bath to 15, and when cool shake it vigorously for 10 minutes with 6·5 of the Purified Petroleum Benzin, separate the Benzin, repeat the shaking out for a few minutes with the remainder of the Benzin and, having carefully and completely separated this second portion of Benzin, evaporate the remaining liquid in a warm place spontaneously until the odour of Benzin has disappeared, removing the last traces by the heat of a water-bath. Mix the deodorised liquid so obtained with 60 of Water, filter the mixture through a paper filter and, having mixed the Alcohol with the filtrate, wash the filter with sufficient Water to make 100.—*U.S.P.*

Average Dose.—8 minims = 0·5 c.c.

It should contain 1·2 to 1·25 p.c. w/v of crystallised Morphine.

This has been incorporated in the *B.P.C.* in a modified form, using Opium, *B.P.*, 7·5, adjusting the strength of the Tincture to 0·75 p.c. of anhydrous Morphine.

TROCHISCUS OPII.—$\frac{1}{10}$ grain of Extract of Opium in each.

Dose.—1 to 6 lozenges.

U.S., Powdered Opium $\frac{1}{13}$ grain in each.

UNGUENTUM OPII.—Extract of Opium, 1; Spermaceti Ointment, 9. Rub the Extract with a small quantity of Water to a syrupy consistence, and mix with the Ointment. (1 in 10)

VINUM OPII (sine Aromat.).—Opium, in powder, 1; Sherry, 10. Macerate 7 days, and filter. (1 of powder in 10)

Used as a **collyrium,** 1 to 16 of Water.

Dose.—10 to 40 minims = 0·6 to 2·4 c.c.

VINUM OPII.—Extract of Opium, 1 oz.; Cinnamon Bark, 75 grains; Cloves, 75 grains; Sherry, 20 fl. oz. Dose.—10 to 40 minims = 0·6 to 2·36 c.c. Each fl. drm. contains about half a grain of Morphine.—*B.P.* 1885.

This has been incorporated in the *B.P.C.*, using detannated Sherry.

NARCEINA. Narceine $C_{23}H_{27}NO_8$, $3H_2O$, eq. 495·55).—In white, silky, acicular crystals; neutral, with a slightly bitter taste. Soluble in 375 parts of cold and in 220 of hot Water, also soluble in Alcohol; insoluble in Ether, and practically insoluble in Chloroform.

It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from contact with air, as it is liable to absorb both Carbon Dioxide and moisture.

Dose.—½ to 1 grain = 0·032 to 0·065 gramme.

Tests.—Narceine should not melt under 165° C. (329° F.). Commercially, pure Narceine should not fuse under 170° C. (328° F.). It contains three molecules of Water of crystallisation, equivalent to 10·8 p.c., which are lost at a temperature of 100° C. (212° F.), and when heated to a still higher temperature it evolves an odour resembling Trimethylamine. The aqueous solution should be neutral in reaction towards Litmus paper, the alkaloid dissolves completely in diluted Sulphuric Acid, and if this acid solution be concentrated on a water-bath a beautiful violet coloration is produced, which changes to cherry-red. On further heating, upon the introduction of a trace of Nitric Acid, a bluish-violet streak is produced. It is precipitated by the usual alkaloidal reagents, *e.g.*, Mercuric Potassium Iodide (Mayer's) Solution, Iodo-Potassium Iodide (Wagner's) Solution and Picric Acid Solution. Diluted Iodine Solution produces a blue coloration. Narceine may be distinguished from Morphine by not immediately yielding a blue coloration with Potassium Ferrocyanide containing a trace of Ferric Chloride T.S. It should leave no weighable residue when ignited with free access of air.

Foreign Pharmacopœias.—Official in Mex. Not in the others.

Under the title **Antispasmin,** a combination of Narceine-Sodium and Sodium Salicylate has been introduced as a hypnotic and sedative.

Dose.—¼ to 2 grains = 0·016 to 0·13 gramme.

Narcyl.—In chemical constitution it is an Ethyl-narceine Hydrochloride, and forms fine silky needles sparingly soluble in Water. It is stated to be useful in allaying the severe cough in cases of pulmonary tuberculosis.

Dose.—1 to 1½ grain = 0·065 to 0·1 gramme, in 24 hours.

NARCOTINA. Narcotine $C_{22}H_{23}NO_7$, eq. 410·12.—Trimetric prismatic crystals, or in large, colourless, glistening needles. Insoluble in Water; soluble in Ether, in boiling Alcohol, and in diluted Acids; insoluble in Potassium Hydroxide Solution. It has no narcotic properties, and has therefore been called **Anarcotina**; it has been given as a substitute for Quinine, as an antiperiodic in ague.

Dose.—1 to 3 grains = 0·06 to 0·2 gramme.

Tests.—Narcotine melts at about 170° C. (338° F.), and when heated to a somewhat higher temperature evolves an odour somewhat resembling Trimethylamine. It dissolves completely in diluted Sulphuric Acid, and on evaporating this solution an orange-red coloration is first produced, changing to a bluish-violet and finally to a reddish-violet. Concentrated Sulphuric Acid dissolves Narcotine with the production of a greenish-yellow colour, rapidly changing to a yellow and finally to a reddish-yellow colour. On the addition of a trace of Nitric Acid to its solution in concentrated Sulphuric Acid a beautiful red coloration is produced; it is precipitated by the usual alkaloidal reagents, *e.g.*, Mercuric Potassium Iodide (Mayer's) Solution, Iodo-Potassium Iodide (Wagner's) Solution, Picric Acid, etc. When heated with Nitric Acid it is oxidised with the formation of Cotarnine.

Narcotine may be distinguished from the majority of other alkaloids by shaking with Acetic Acid Solution (2 p.c.) and filtering, the filtrate, when evaporated to dryness, should leave no weighable residue. It may be distinguished from Morphine by shaking with Sodium Hydroxide Solution (5 p.c.), the filtrate should yield no crystalline precipitate in 24 hours when treated with an excess of Ammonium Chloride Solution. It should leave no weighable residue when ignited with free access of air.

COTARNINÆ HYDROCHLORIDUM. Cotarnine Hydrochloride, Stypticin, $C_{12}H_{13}NO_3H_2O$ HCl, eq. 271·57.—A pale yellow, crystalline powder, soluble in Water and in Alcohol. Cotarnine is produced by the oxidation of Narcotine, usually by means of Nitric Acid. Cotarnine Hydrochloride is the Hydrochloride of this oxidation product.

Dose.—⅓ to ½ grain = 0·021 to 0·032 gramme, given in capsule, or by hypodermic injection.

It may also be prescribed as a 1 in 10 **Tincture,** made with Tincture of Cinnamon. Dose.—10 drops in Water 4 times a day.—*B.M.J.E.* '01, ii. 68.

Valuable in menorrhagia. Contra-indicated in threatened abortion.—*P.J.* '95, ii. 471; *B.M.J.* '96, ii. 17; *B.M.J.E.* '96, i. 7; '98, i. 71, 103.

In uterine hæmorrhage and in hæmorrhage during pregnancy, menopausal bleedings and post-puerperal hæmorrhage. Failed almost entirely in all the cases of chronic metritis and endometritis.—*Pr.* lxiii. 441; *B.M.J.E.* '99, ii. 86.

Principally useful in cases in which there is an unhealthy condition of uterine mucous membrane, but of little value in cases in which fibroid, cancer or other new growths are present; of very little value in connection with pregnancy; 2½ grains is the minimum dose, repeated 3 or 4 times in the 24 hours, and continued over long periods of time.—*F.T.* '07, 15. One of the most valuable uterine hæmostatics and sedatives.—*F.T.* '07, 80.

Tablets, each containing 0·05 gramme = ¾ grain, are made.

Tests.—Cotarnine Hydrochloride dissolves readily in Water, forming a yellowish solution, and should be neutral towards Litmus. A 6 p.c. aqueous solution of the salt, when treated with Iodo-Potassium Iodide Solution, yields a brownish precipitate, which re-crystallises from Alcohol and melts at about 142° C. (287·6° F.). If 3 drops of Sodium Hydroxide Solution (15 p.c.) be added to a solution of 0·1 of a gramme of the Hydrochloride in 3 c.c. of Water, the addition of each drop produces a milky turbidity which again disappears on shaking, the free base crystallising from the clear solution. The precipitate should be white, and the supernatant liquid clear and of a pale yellow colour. The crystalline base, when separated, should possess a m.p. of about 130° C. (266° F.), but the m.p. is stated to depend largely upon the rapidity with which it is heated; should the above supernatant liquid be turbid or strongly coloured, it indicates the presence of foreign impurities. The salt should leave no weighable residue when ignited with free access of air.

COTARNINÆ PHTHALAS (Styptol).—A micro-crystalline powder, soluble in Water. Useful in arresting uterine hæmorrhage. May be given in doses of ¾ grain = 0·05 gramme, in powder or cachet.—*B.M.J.E.* '03, ii. 36.

Three grains dissolved in 35 minims of Water can be used subcutaneously to rapidly arrest hæmorrhages.—*B.M.J.* '05, i. 311. Stated to possess the advantage over Stypticin of being less irritating. Employed as a 2 to 5 p.c. solution in superficial inflammations. For extensive eczema a 1 to 2 p.c. solution was found best, while a 5 p.c. solution was used for small furuncles. Internally it may be given in the form of powder in doses of 0·1 gramme (1½ grains) or in the form of a tablet 0·05 gramme (¾ grain) 4 to 6 a day on an average.—*M.P.* '05, ii. 299.

Tests.—When tested with solutions of Sodium Hydroxide Solution (15 p.c.) as described above under Cotarnine Hydrochloride it should yield a base possessing the m.p. of Cotarnine. It should leave no weighable residue when ignited with free access of air.

PAPAVERINA. Papaverine. $C_{20}H_{21}NO_4$, eq. 336·66.—White, crystalline needles, or colourless, trimetric prisms. Insoluble in Water; sparingly soluble in Alcohol and Ether. Strongly narcotic.

Dose.—$\frac{1}{12}$ to $\frac{1}{3}$ grain = 0·0054 to 0·0216 gramme.

Tests.—Papaverine melts at about 147° C. (296·6° F.). It yields when warmed with Sulphuric Acid a bluish-violet coloration; in Nitric Acid it dissolves with a dark red colour. When treated with Chlorine Water it dissolves with a production of a greenish coloration, which on the addition of Ammonia Water changes after some time to a blackish-brown coloration. It should yield no weighable residue when ignited with free access of air.

Not Official.

OREXIN.

CEDRARINE. PHENYL-DIHYDRO-QUINAZOLINE.

$C_{14}H_{12}N_2$, eq. 206·62.

A whitish amorphous powder, having a pungent taste, and having an irritating effect on the nostrils, inducing violent sneezing. Insoluble in Water.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

OREXIN HYDROCHLORIDE ($C_{14}H_{12}N_2HCl$, $2H_2O$, eq. 278·57).—In white needles, or as a white powder, soluble in Water and in Alcohol (90 p.c.); insoluble in Ether. Stated to possess a stimulating effect on the appetite, and to be found useful in nervous dyspepsia. This salt is now entirely superseded by the Tannate.

Dose.—2 to 8 grains = 0·13 to 0·52 gramme.

OREXIN TANNATE.—A pale yellow, amorphous, odourless and tasteless powder, insoluble in Water; 1 in 50 of Alcohol (90 p.c.). Introduced as a gastric tonic. Useful in the anorexia of phthisis. It has been recommended as a prophylactic against sea-sickness, and also to control the obstinate vomiting following Chloroform narcosis. It is contra-indicated in hyperacidity of the stomach.—*L.* '00, i. 1020; *B.M.J.E.* '02, ii. 96; *M.A.* '00, 493; *P.J.* '03, i. 162.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme, in a cachet, 1 or 2 hours before a meal. It should not be prescribed with solutions containing Iron salts.

Foreign Pharmacopœias.—Official in Jap.

Tests.—Orexin Tannate when heated with Zinc dust or powdered Zinc it evolves a strong odour resembling Iso-nitrile, and on treating this mixture with very dilute Hydrochloric Acid the filtrate yields a blue coloration on the addition of Chlorinated Lime Solution. It should leave no weighable residue when ignited with free access of air.

Not Official.

OVI ALBUMEN.

The liquid white of the Egg, *Gallus Bankiva* var. *domesticus*, Temm., was official in the *B.P.* '85, and now appears in the Appendix of the *B.P.* '98. It is a glairy, viscid, colourless, or pale yellowish liquid. It may be obtained in the solid state by cautious evaporation at a temperature below 50° C. (122° F.). It is employed as an antidote in poisoning by Copper, Mercury, or Silver salts, and for certain purposes of clarification.

Commercial dried Albumen is in thin, transparent flakes, which should be free from unpleasant taste or odour of putrefaction.

It is coagulated by heat, and is then rendered white, opaque and insoluble; in this condition it is employed officially as a test for Pepsin.

By the action of the gastric juice or of Pepsin in weak Hydrochloric Acid solution, or by Trypsin, Albumen is first converted into acid-Albumen or Syntonin, and finally into Peptone.

A solution of Albumen is used as a means of proving the absence of Metaphosphoric Acid from Acetum Phosphoricum Concentratum.

Foreign Pharmacopœias.—The dried white is official in Dan., Dutch, Ger., Ital., Swed.; the liquid white in the Fr., Mex. and Port.

EIGONS.—Alpha and Beta-Eigons are stated to be stable combinations of Iodine with Albumen and Peptone respectively, and the corresponding Brom-Eigons are similar preparations containing Bromine.

α-EIGON is a light, yellowish-grey powder, possessing a faint odour. Insoluble in Water; soluble in solution of Sodium Hydroxide forming Sodium α-Eigon. It contains about 20 p.c. Iodine. Employed internally and used as a dusting powder. Introduced as a substitute for Iodoform and the Iodides; also used in veterinary practice.—*P.J.* '01, i. 702.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

β-EIGON.—A light, yellowish-brown powder, possessing a faint Peptone odour. Soluble in Water, on which account, and as it is stated to be readily assimilable, it has been given in derangements of the stomach.

The Bromine compounds have been employed as sedatives in doses of 10 to 15 grains = 0·65 to 1 gramme, 3 or 4 times daily.—*B.M.J.E.* '02, i. 47.

IODALBACID.—A yellowish, tasteless, odourless powder, soluble in Water. It is a combination of Iodine and Albumen, and is stated to be useful as a substitute for the alkaline Iodides.

Dose.—15 to 30 grains = 1 to 2 grammes,

OVI VITELLUS.—The yolk of the Egg of *Gallus Bankiva* var. *domesticus* was official in *B.P.* '85, and now appears in the Appendix of the *B.P.* '98. It is officially used in the preparation of Mistura Spiritus Vini Gallici, and is unofficially employed as an emulsifying agent.

GLYCERITUM VITELLI.—Fresh yolk of Egg 9, Glycerin 11; rub the yolk of Egg in a mortar with the Glycerin gradually added, and mix thoroughly. —*U.S.P.* 1890.

LECITHIN (Choline Distearyl-glycerophosphate).—A translucent, yellow or yellowish-white, hygroscopic, waxy solid, which should be completely soluble in Chloroform. It is a phosphorised organic constituent contained in considerable proportion in the yolk of Egg, from which it is chiefly prepared. It has been employed in neurasthenia, in brain and nervous diseases, and in tuberculosis. It may be injected hypodermically in doses of ¾ to 2 grains = 0·05 to 0·13 gramme, dissolved in sterilised oil.—*L.* '02, i. 392, 676, 687, 1119; *C.D.* '01, ii. 725; '02, ii. 155.

Dose.—1 to 5 grains given in the form of pill, granules, or as a confection.

Lecitogen.—A combination of Lecithin and Cocoa. It occurs as a powder pleasant to the taste, is taken in doses of 3 or 4 teaspoonfuls daily in Milk or Water, and is useful in secondary anæmias.—*B.M.J.E.* '05, ii. 100.

Not Official.

OXYGEN.

A colourless, odourless, tasteless gas, it has been condensed to a liquid at a very low temperature and under great pressure; but as supplied for medical purposes it is in the form of compressed gas. It may be prepared in small quantities by heating Potassium Chlorate mixed with half its weight of pure dry black Manganese Oxide, and subsequent purification of the gas; but on the commercial scale it is generally prepared from pure dry air by absorption with caustic Baryta.

When employed medicinally, it is generally inhaled from bags connected with cast-iron cylinders, containing 10, 20 and 40 cubic feet of compressed gas, furnished with gun-metal taps.

Ital. requires that it shall be free from Carbonic Acid gas, from Chlorine compounds, and from Ozone.

Medicinal Properties.—Useful in pneumonia, bronchitis, bronchial catarrh, asthma. It has also been employed in poisoning by coal-gas, and Carbon Monoxide. In the form of Hydrogen Peroxide it has been used in Cyanide poisoning.

A case of acute double pneumonia successfully treated with Oxygen.—*L.* '01, ii. 840.

Case of fetid bronchorrhœa treated by inhalation for several hours daily.—*B.M.J.* '02, i. 509.

Treatment at the Oxygen Hospital of 88 cases of various skin diseases, including also 9 cases of consumption; of these 50 were discharged cured, and 13 were greatly relieved; in all the cases of consumption the disease was arrested.—*L.* '03, ii. 274.

Tried with success (*L.* '05, ii. 636) in epileptic fits.

In pneumonia is seldom required, and its value is stated (*B.M.J.* '05, i. 812; *L.* '07, i. 808) to be much over-estimated and disappointing.

Its administration is stated (*B.M.J.E.* '05, ii. 48) to have given favourable results in cases of chlorosis, more particularly those manifesting severe gastric disturbance and intolerant of Iron.

Foreign Pharmacopœias.—Official in Fr. (*Oxygène*); Ital. (*Ossigeno*); Mex. and Span. (*Oxygeno*).

OZONE.—Is an allotropic modification of Oxygen, produced by passing a silent discharge of electricity through Oxygen Gas. This gas possesses a peculiar odour, somewhat suggestive of dilute Chlorine. It is a powerful oxidising agent. When present in the air in large quantities it frequently produces irritation of the mucous membrane.

SODIUM PEROXIDE.—A white amorphous powder, which dissolves in Water with a hissing noise, with evolution of heat and formation of Hydrogen Peroxide. It is a powerful oxidising agent.

Under the names of **Biogen** and **Hopogan,** Manganese Peroxide and Magnesium Peroxide have been prepared and introduced into commerce; they evolve Oxygen on contact with a dilute Acid.

BENZOYL PEROXIDE.—Well-formed white prisms, m.p. 103·5° C. (218·3° F.). Insoluble in Water; soluble in Oil to the extent of 2 to 3 p.c. Prepared by the action of Sodium Peroxide on Benzoyl Chloride. It is a powerful disinfectant (*P.J.* '05, ii. 330), useful in the treatment of burns, wounds and many skin diseases. It may be prescribed in oily solution or as the following ointment: Benzoyl Peroxide, 1; Vaseline, 5; Lanolin, 5.

OXYMEL. *See* MEL.

OXYMEL SCILLÆ. *See* SCILLA.

Not Official.

PANCREAS ENZYMES.

Pancreatic Juice, the fluid secreted by the fresh and healthy pancreas of the pig, Sus scrofa, or of the ox, Bos taurus, is known to possess four distinct properties: (*a*) the conversion of proteids, (*b*) the conversion of Starch and Glycogen, (*c*) the emulsification of fats, and (*d*) the curdling of Milk. Each of these properties is attributable to a peculiar ferment or enzyme, which as originally present in the pancreas is in an insoluble and inactive condition, known as a Zymogen, the ultimate solution depending upon the conversion of this insoluble and inactive Zymogen into a soluble and active enzyme by the aid probably of the digestive action of the intestinal ferment Entero-kinase. The conversion may also be brought about by the action of diluted acids. The enzymes act only in neutral or alkaline solutions. Their action is suspended in feebly acid solutions, and when digested at 40° C. (140° F.) for an hour in a solution of Pepsin of the normal acidity of the stomach (equal to 0·2 p.c. Hydrochloric Acid), or when digested with gastric juice, they are destroyed. They are also destroyed in solution by heating to 75° C. (167° F.). The juice is precipitated by mineral acids, metallic salts, and by Tannic Acid. When treated with an excess of Alcohol (90 p.c.) or stronger, it is precipitated. It undergoes putrefactive change with great rapidity. The process of isolating the ferments in an active condition from the fresh juice of the pancreas gland, is extremely complicated and involves much time and careful work. The products usually obtainable commercially are of a widely divergent character, and, considered from the point of view of their proteolytic and amylolytic activity, some are quiet inert.

An even greater divergence exists in solutions of the enzymes prepared for hypodermic use, than in the commercial dried ferments, some solutions indicating the devotion of but little attention in their preparation to the purposes which they are intended to serve.

Official Preparation.

LIQUOR PANCREATIS. PANCREATIC SOLUTION.

A liquid prepared from 5 oz. of the fresh fat-free pancreas of the pig, from which the external membrane has been removed, and finely divided by triturating with washed sand or powdered pumice-stone. The mixture is digested in a closed vessel in 20 fl. oz. of Alcohol (20 p.c.) for a week and filtered.

Tests.—A measured quantity of 2 c.c. of the solution is mixed with 0·2 of a gramme of Sodium Bicarbonate and 20 c.c. of Water, and the mixture added to 80 c.c. of fresh cow's Milk, previously brought to a temperature of 45° C. (113° F.). The mixture is kept at this temperature for 1 hour, at the end of this time the milk should be so completely peptonised that a portion removed and added to some Nitric Acid in a test-tube should no longer produce a coagulation. In carrying out the test it is preferable to add a little Ether to dissolve the fat, which may otherwise be mistaken for a coagulation.

The above resembles **Liquor Pancreaticus** (Benger), which was introduced in 1879.

Not Official.

The ferments which have been prepared from the juice, and regarding which more or less definite knowledge exists at the present time, are **Trypsin, Amylopsin, Lipase** (Steapsin) and **Rennin** (Chymosin).

PANCREATINUM (Pancreatin).—Commercial Pancreatin is a mixture of the enzymes existing in the pancreas of the hog. It is not official in either the *B.P.* or the *P.G.* The *U.S.P.* defines Pancreatin as a mixture of the enzymes naturally existing in the pancreas of warm-blooded animals, usually obtained from the fresh pancreas of the hog (Sus scrofa *var.* domesticus, Gray), or the ox (Bos taurus, Linné), and consisting principally of Amylopsin, Myopsin, Trypsin and Steapsin, and proved to be capable, when assayed by the under-mentioned method, of converting not less than 25 times its own weight of Starch into substances soluble in Water. A method is also given of ascertaining its power of digesting soluble proteids.

It is a yellowish, cream-coloured, or greyish amorphous powder, possessing a faint characteristic though not unpleasant odour, and a taste somewhat resembling meat. It dissolves slowly and almost completely in Water, but is only partially soluble in Alcohol (90 p.c.). It digests both soluble and insoluble Albumens, and when brought into contact with amylaceous material rapidly induces hydrolysis, converting it into soluble products, *e.g.*, Sugar, Dextrose, or Maltose. It exhibits these powers to the greatest advantage in alkaline or in neutral solutions. The presence of mineral acids or an excess of alkali has a retarding influence upon its digestive activity, whilst, similarly to the juice, its activity is altogether destroyed by Pepsin in acid solution.

Foreign Pharmacopœias.—It is official in Fr. and Mex. (Pancreatin); Ital. (Pancreatina Medicinale); Jap. (Pankreatinum); Span. (Pancreatina); and U.S. (Pancreatinum).

Tests.—Pancreatin may be assayed for its proteolytic and amylolytic activity by its action upon the soluble Albumens of Milk and upon Starch. The *U.S.P.* employs a process of which the following embraces the essential features:—A weighed quantity of 0·28 gramme of Pancreatin is mixed with 1·5 grammes of Sodium Bicarbonate and 100 c.c. of tepid Water. A measured quantity of 400 c.c. of fresh cow's Milk is raised to a temperature of 38° C. (100·4° F.), and the Pancreatin mixture is added, the whole being maintained at the above temperature for 30 minutes. At the end of this time the Milk should be so completely peptonised that a small portion when diluted with three times its volume of water should produce no coagulation when mixed with some Nitric Acid.

The *U.S.P.* method of determining the amylolytic activity is as follows:—A weighed quantity of 7·5 grammes of Starch is mixed with 120 c.c. of Water and boiled until a translucent mixture results, which is then cooled to 40·5° C. (105° F.). A weighed quantity of 0·3 of a gramme of Pancreatin, dissolved in about 10 c.c. of Distilled Water at 40·5° C. (105° F.), is then added, the flask well shaken, and the temperature of the mixture maintained at 40·5° C. (105° F.) during 5 minutes, at the end of which time the Starch should have been converted into substances soluble in Water. 2 drops of Tenth-normal Volumetric Iodine Solution are mixed with 60 c.c. of Water, and 4 drops of the warmed converted Starch Solution are added to the mixture; either no coloration or at most a wine-red colour should result, showing the presence of Dextrin and Maltose. The appearance of a blue colour will indicate the presence of unconverted Starch, and the Pancreatin is below the standard, namely, that of converting not less than 25 times its own weight of Starch into substances soluble in Water.

TRYPSIN.—Trypsin is not official in the *B.P.*, *U.S.P.*, or *P.G.* It is given as a synonym for Pancreatin in the Spanish Pharmacopœia. It acts slowly on solid albuminoid masses, *e.g.*, boiled Egg Albumen, but with great rapidity on soluble Albumen, such as the Casein of Milk. It converts Albumens into Peptones and subsequently into bodies which are not proteids, Leucin, Tyrosin, etc. The activity gradually increases with the temperature up to 50° C. (122° F.), and rapidly diminishes up to 75° C. (167° F.) when the ferment is destroyed. Although the activity of the ferment is thus manifest with increasing temperature, solutions of the enzymes undergo rapid deterioration when subjected to prolonged warmth, and carefully-prepared solutions, which have been subjected to temperatures such as those experienced in a voyage through the tropics, have lost as much as 75 p.c. of their activity during their passage out and home.

Trypsin forms a yellowish or yellowish-brown powder, possessing a meaty odour. It occurs together with Amylopsin, Lipase (Steapsin), and Myopsin in the fresh juice of the pancreas. It is partially soluble in Water; insoluble in Alcohol (90 p.c.). The commercial dried product varies enormously, some specimens being exceedingly active proteolytically as well as amylolytically, others only relatively proteolytically active, whilst again other preparations possess neither a proteolytic nor an amylolytic action.

Although Trypsin acts best in alkaline solution, *e.g.*, Sodium Bicarbonate or Sodium Carbonate, when in solution with the latter it rapidly deteriorates at a temperature of (or above) 38° C. (100·4° F.).

It is regarded (*J.C.S. Abs.* '05, ii. 47) as possible that the pancreatic enzyme Trypsin really consists of a number of specific ferments, each acting on different proteids. No free Trypsin is present in the secretion of the pancreas (*J.C.S. Abs.* '03, ii. 559), the liberation of that enzyme is the work of the intestinal juice, gastric juice not being able to affect it.

Tests.—Trypsin may be assayed for its proteolytic and amylolytic activity by the methods described under Pancreatinum, using either a proportionately smaller quantity of the enzyme or correspondingly reducing the time allowed for the reaction. The comparative strengths of the various Trypsin preparations are referred to under the heading of Injectio Trypsini Co. (*Squire*).

AMYLOPSIN (Pancreatic Diastase).—It occurs together with Trypsin, Lipase (Steapsin), and Myopsin in the fresh juice of the pancreas. The dried ferment is not found in an active condition as a commercial article. Solutions of the ferment are extremely difficult to prepare, and even the best known products, although claiming to be free from the proteolytic ferment (Trypsin), can only be considered relatively so, as will be seen from the results published by Dr. P. Tetens Hald in his paper upon the comparative strengths of some commercial Trypsin preparations, in the *Lancet* '07, ii. 1371. It possesses great activity in digesting amylaceous material, and when carefully prepared possesses but relatively little action on soluble or insoluble proteids.

Pancreatic diastase converts Starch into Dextrin and Maltose. Its action on Starch foods is very similar to or identical with that of Ptyalin, the salivary ferment. It is usually stated to be identical with the Diastase of Malt, but it is doubtful if it is so, as it is found to be affected quite differently to the latter by acid or alkali. Diastase from either source acts most rapidly in solutions which are practically neutral. The Malt ferment is retarded by acid, but almost stopped by a very small quantity (about 0·1 p.c.) of alkali. The pancreatic ferment, on the contrary, is retarded by alkali and almost stopped by a minute quantity of acid; moreover, the activity of Malt Diastase towards Starch Solution is inversely proportional to the quantity of the ferment present, whilst the activity of the Amylopsin (Pancreatic diastase) is inversely proportional to the square root of the quantity of ferment present.

Tests.—The amylolytic activity of Amylopsin or solutions of Amylopsin may be determined by the test with Starch Solution described under Pancreatinum.

Medicinal Properties.—The various pancreatic solutions, powders and tablets are used to peptonise foods previous to administration, but they are also given with food at the beginning of a meal. Pancreatin in pills (Keratin coated) has been given in certain cases of diabetes. The enzymes of the pancreas gland have been employed with a certain measure of success in the treatment of malignant growths. A sufficient length of time has not elapsed, nor has a sufficient amount of evidence yet been accumulated, to enable a positive opinion to be expressed regarding their exact value in the treatment, but there is little doubt that they are now being given an extensive trial. There can also be little doubt that failure has in numerous instances been due to the use of almost inert preparations of the enzymes. That there is considerable variation in strength even in the best and most trustworthy preparations is evidenced by the comparative researches on the tryptic strength of different Trypsin preparations recorded (*L.* '07, ii. 1371) in the paper by P. Tetens Hald.

The 'Problems of Cancer' formed the subject of a lecture at the Edinburgh Pathological Club, and the text appears in the *L.* '04, ii. 1200. A further communication was made in a lecture at the University of Liverpool on January 20th, 1905, and afterwards reported in the *L.* '05, ii. 283.

A record of the action on Jensen's mouse tumour is given in the *B.M.J.* '06, i. 140.

We (Editorial) certainly think that he (Morton) has made out a case for a trial on a larger scale.—*B.M.J.* '07, i. 159. In the pathological reports and results of the microscopical examination of sections taken from the tumour mass of one of Morton's cases there were evidences of degenerative changes indicative of some destructive process, but whether they were due to X-rays or to Trypsin it was impossible to say. No new nodules were observed from the time the patient received these large doses of Trypsin to the time of his second operation, nor did those already existing increase materially in size. Microscopic examination of the nodules showed the cancer was still active. There was no evidence that the Trypsin treatment had exerted any definite influence on the tumour cells.—*B.M.J.* '07, i. 488, 520.

A paper on the Trypsin treatment for cancer appears in the archives of the

Middlesex Hospital (6th Cancer Report); from the observations the authors conclude that the course of cancer, both as a disease and as a morbid process, is unaltered by the administration of Trypsin and Amylopsin.—*B.M.J.* '07, i. 1447.

The cell solution produced by Pancreatin is mostly only a circumscribed process, and when sufficiently large quantities of the ferment are injected there is no selection between the carcinomatous and healthy tissue. The pancreatic ferment possesses a theoretical interest only (Leyden and Bergell).—*Deut. med. Wochenschrift*, 1907, xxiii. 913; *B.M.J.* '07, ii. 161.

Amongst a number of favourable conclusions to a report of experiments instituted by W. J. Morton to test Beard's statements, are the following:—In all cases signs of amelioration in the progress of the disease have been observed; enlarged glands associated with cancer have rapidly diminished in size under the influence of Trypsin; Trypsin has a decided effect in reducing cancer cachexia and in improving the general health; patients frequently refer their greatest feeling of improvement to the period of time when they are taking Amylopsin followed by Trypsin; the pure diastase (Injectio Amylopsini) had much to do with the favourable results; Trypsin should be used in larger doses feeling one's way, for instance, from 20 to 30 minims daily for from 4 to 6 weeks and then resorting to Amylopsin; Trypsin deserves further trial.—*B.M.J.E.* '07, i. 11.

The direct action of Trypsin on growing cancer cells, as shown clinically and microscopically, is sufficient warrant to continue the treatment in inoperable cases, especially in view of the fact that there are apparently no serious results that can occur from its use.—*B.M.J.E.* '07, i. 27.

Case of sarcoma of the testicle successfully treated with Trypsin injections. At the end of the treatment the wound remained closed, and the growth, as far as one could feel, was completely absorbed, the lumbar pains had disappeared, and the man was able to follow his employment without fatigue.—*B.M.J.E.* '07, ii. 79.

A case of growing abdominal tumour treated by hypodermic injections of Trypsin and Amylopsin. The vomiting, nausea, and flatulence disappeared, and the appetite improved, then gradually the pain lessened and the swelling also steadily diminished, while the weight regularly increased.—*B.M.J.* '07, ii. 525.

We (Editorial) have no wish to condemn the Trypsin treatment; we have heard of cases where improvement appeared to have resulted from the Trypsin injections. We have also heard of cases where no benefit occurred. When the treatment has been tested systematically both on mice and men it seems to have failed completely, and it is only by a thorough trial that we can come to a correct conclusion as to its value.—*L.* '07, ii. 240.

A record of six cases successfully treated by hypodermic injections of Trypsin, including a case twice operated upon at the Middlesex Hospital and finally discharged as hopeless.—*G.P.*, 1907, 548.

A case described as malignant disease of the cæcum treated by hypodermic injections of Trypsin. Whilst not wishing to minimise the beneficial effects which followed the injections and which began to be experienced almost immediately, it is not desired that the record of the case should raise false hopes.—*G.P.* '07, 804.

A case of extreme malignancy treated by hypodermic injection of Trypsin and local application of a pancreatic lotion. Decrease in size, disappearance of faetor, and discharge scarcely more than that from a simple healing ulcer.—*G.P.* '07, 807.

The technique of the Trypsin-Amylopsin injections.—*G.P.* '07, 810, 818.

A case of carcinoma of the liver treated by injections. Growth materially reduced in size, and pain and nausea disappeared.—*G.P.* '08, 178.

Trypsin is of considerable value in cancer. Carcinoma of the cervix uteri, rodent ulcer, and epithelioma are eminently suitable for the treatment. Gout, rheumatoid arthritis, and chronic rheumatism ought to be treated by Trypsin injections when other better known methods have failed. Regarding Amylopsin, when injected singly or in combination with Trypsin, it has been found to be of no value in the treatment of cancer.—*B.M.J.* '08, i. 80.

INJECTIO TRYPSINI COMP. (*Squire*). Squire's Compound Injection of Trypsin.—A standardised sterilised liquid, prepared direct from the fresh and healthy pancreas of the pig. It is of maximum potency, containing a definite number of units of the proteolytic enzyme (Trypsin), and of the amylolytic enzyme (Amylopsin). It is made in three strengths, known as Standards I., II., and III., and is contained in hermetically-sealed glass capsules of a dark amber tint holding 1 c.c., sufficient for an average dose of the injection.

Dose.—The average dose varies from 17 to 34 minims = 1·0 to 2·0 c.c., subcutaneously injected deeply, not into the growth itself, but into the healthy tissue in the immediate neighbourhood of the growth, or into the back or buttock; the injections being made daily and the dose gradually increased. Small doses of Trypsin are quite useless.

Method of Hypodermic Use.—When required for use the glass capsule should be rinsed first in 1 in 1000 Corrosive Sublimate solution, then in sterilised Distilled Water, broken at the file-mark on the neck, and the contents drawn into the carefully sterilised all-glass hypodermic syringe. The injections should be carried out under the strictest aseptic precautions, and the employment of heat avoided at all stages of the process.

Injectio Trypsini Comp. should be used at the commencement of the treatment, starting with 1 c.c. of Standard II., and if no bad symptoms arise, continue these injections daily for at least 6 weeks. If after a few injections the patient gets lethargic or depressed, with headache and palpitation, put him for a few days on Standard I., then on alternate days on Standards I. and II., and subsequently, with careful watching, get back to Standard II. every day. After 2 months' treatment the medical practitioner must be guided by each individual case as to how much Trypsin and Amylopsin to give. The method for the next month or so is to give about 5 Trypsins to 1 Amylopsin, with 1 day's rest to each week. After a long course of Trypsin, or if any septic symptoms arise, Amylopsin must be pushed, and even then the method is to give a Trypsin in the morning and an Amylopsin in the evening.

INJECTIO AMYLOPSINI (*Squire*). Squire's Injection of Amylopsin.—A standardised sterilised liquid of maximum potency, prepared direct from the fresh and healthy pancreas of the pig. It contains a high number of Amylopsin units, and is relatively free from the proteolytic enzyme (Trypsin).

It is contained in hermetically-sealed glass capsules of a dark amber tint holding 1 c.c., sufficient for an average dose of the injection.

Dose.—The average dose varies from 17 to 34 minims = 1·0 to 2·0 c.c., subcutaneously injected deeply, not into the growth itself, but into the healthy tissue in the immediate neighbourhood of the growth, or into the back or buttock; the injections being made daily and the dose gradually increased.

Method of Hypodermic Use.—When required for use the glass capsule should be rinsed first in a 1 in 1000 Mercury Perchloride solution, then in sterilised Distilled Water, broken at the file-mark on the neck, and the contents drawn into the carefully sterilised all-glass hypodermic syringe. The injections should be carried out under the strictest aseptic precautions, and the employment of heat avoided at all stages of the process.

The Amylopsin injection is meant to replace the Trypsin injection in the later periods of the treatment, and to meet bad symptoms, such as nausea, vomiting, pain in the back, drowsiness, albuminuria, etc., which may arise.

LIQUOR PANCREATICUS FORT. (*Squire*). Squire's Strong Pancreatic Solution.—A standardised solution of the enzymes prepared from the fresh and healthy pancreas of the pig, for internal administration.

Dose.—1 to 2 fl. drm. = 3·6 to 7·1 c.c. 3 times daily half an hour before food.

LIQUOR TRYPSINI COMP. (*Squire*). Squire's Compound Trypsin Solution.—A solution prepared on somewhat similar lines to the above.

Dose.—1 to 2 fl. drm. = 3·6 to 7·1 c.c. 3 times daily half an hour before food.

TABELLÆ PANCREATICÆ FORT. (*Squire*). Squire's Strong Pancreatic Tablets.—Tablets for internal exhibition, weighing about 8 grains, containing the digestive enzymes of the fresh and healthy pancreas of the pig.

Dose.—1 or 2 tablets 3 times daily half an hour before food.

LOTIO PANCREATICA FORT. (*Squire*). Squire's Strong Pancreatic Lotion.—A standardised limpid liquid, containing the digestive enzymes of the fresh and healthy pancreas of the pig. It exerts a powerful solvent action on animal proteids, and is of value as a surgical solvent. For use as a pigment it may be applied locally with a brush undiluted, or when diluted 1 to 5 to 1 to 10 as a rectal or vaginal injection.

A corresponding Lotio Trypsini Comp. (*Squire*) is also made.

GYNECOL AND ENICOL PANCREATICUS FORT. (*Squire*). Squire's Strong Pancreatic Pessary and Suppository.—These preparations are made for continuous local solvent action in such cases (uterine and rectal) as admit of this form of treatment.

They are made in small and large sizes.

LIQUOR PANCREATICUS.—Glycerin of Pancreatin, 16·50; Sodium Bicarbonate, 3·50; Glycerin, 5; Alcohol, 15; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

ELIXIR PANCREATIN.—Pancreatin, 5; Sodium Bicarbonate, 3; Alcohol, 15; Distilled Water, 45; Aromatic Elixir, *q.s.* to produce 100.—*B.P.C.*

GLYCERINUM PANCREATIN. *Syn.* Glycerol of Pancreatin.—Pancreatin, 10; Glycerin, 50; Simple Elixir, 5; Distilled Water, *q.s.* to produce 100.—*P.J.F.* and *B.P.C.*

PULVIS PANCREATICUS COMPOSITUS. *Syn.* Peptonising Powder. —Pancreatin (*U.S.P.*), 20; Sodium Bicarbonate, 80. Mix them by trituration. —*U.S.N.F.*

Note.—1·5 grammes of this powder are sufficient to peptonise 500 c.c. of fresh cow's Milk, or 25 grains will peptonise 20 fl. oz. in the following manner:—Add 1·5 grammes of the Compound Pancreatic Powder to 125 c.c. of tepid Water contained in a suitable flask, and afterwards add 500 c.c. of fresh cow's Milk previously heated to 38° C. (100·4° F.). Maintain the mixture at this temperature for 30 minutes, then transfer to a cold place. Milk thus peptonised should not be used after it has been kept for 24 hours or when it has developed a bitter taste.—*U.S.N.F.*

This has been incorporated in the *B.P.C.*

PULVIS PRO LACTE HUMANISATO. *Syn.* Humanising Milk Powder. —Compound Pancreatic Powder (*N.F.*), 35; Sugar of Milk, 965. It is used for preparing Milk as follows:—Triturate, 6·5 grammes of the Milk Powder with 62 c.c. of Water, transfer to a clean bottle containing 62 c.c. of fresh cow's Milk, and 15 c.c. of Fresh Sweet Cream, and immerse the bottle in Water heated to 38° C. (100° F.) for 15 minutes. Then pour the mixture into a vessel and heat it quickly to boiling and immediately allow it to cool to the body temperature. Humanised Milk should be prepared immediately before use and the directions carefully followed.—*U.S.N.F.*

This has been incorporated in the *B.P.C.*

PEPTONISED MILK.—A pint of Milk is diluted with 4 fl. oz. of Water and heated to 140° F. (60° C.).* To this add 2 teaspoonfuls of Liquor Pancreatis and 20 grains of Sodium Bicarbonate. Place in a jug and cover with a 'cosey' to keep it warm. At the end of an hour, or rather more, boil the contents of the jug. The product can be used like ordinary Milk.

Peptonised Milk can also be prepared at about 60° to 65° F. Dilute a pint of Milk with half a pint of Lime Water, or with half a pint of Water containing 20 grains of Sodium Bicarbonate in solution; to this add 3 teaspoonfuls of Liquor Pancreatis. The mixture is set aside in a jug for 3 or 4 hours, by which time the Milk will have developed a slightly bitter taste and will be ready for use.

The bitter taste is well covered by Soda Water, or it may be warmed and sweetened for infants.

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* If a thermometer is not at hand, the proper temperature may be obtained by boiling one-half of the mixture and adding it to the other half which is cold.

If it is used as soon as ready it need not be boiled, but if not it must be boiled to prevent the change proceeding far enough to render it unpalatable.

Peptonising Powders and Tablets are also used in place of the Liquor Pancreatis. The powders generally contain the Sodium Bicarbonate mixed with the Pancreatin, ready for use.

PEPTONISED GRUEL – Gruel from wheaten flour, oatmeal, arrowroot, sago, pearl barley, pea or lentil flour, should be very well boiled and made thick and strong. It is then poured into a covered jug and allowed to cool to a lukewarm temperature. Liquor Pancreatis is then added, 2 teaspoonfuls to a pint of gruel. At the end of 3 hours the product is boiled and strained. The starch of the meal is converted into sugar, and the albuminoid matters are peptonised.

PEPTONISED MILK-GRUEL.—To a good thick Gruel, prepared from any of the above-mentioned farinaceous articles, while still hot, add an equal quantity of cold Milk; the mixture will be about 125° F. (52° C.). To each pint of this mixture add 2 teaspoonfuls of Liquor Pancreatis and 20 grains of Sodium Bicarbonate. Set aside in a warm place for 2 or 3 hours until a perceptible bitterness is developed and not longer, then heat to the boiling point and strain.

PEPTONISED BEEF-TEA.—Half a pound of finely minced lean beef is mixed with a pint of Water and 20 grains of Sodium Bicarbonate. This is simmered for 2 hours in a covered saucepan; the resulting Beef-tea is decanted off into a covered jug, the undissolved beef residue is then beaten up with a spoon into a pulp and added to the Beef-tea. When it has cooled down to about 140° F. (60° C.) a tablespoonful of the Liquor Pancreatis is stirred in. The mixture is kept warm for 2 or 3 hours and occasionally stirred. At the end of this time the contents of the jug are boiled briskly for 2 or 3 minutes and finally strained. Beef-tea prepared in this way is rich in peptone, and when seasoned with salt is scarcely distinguishable in taste from ordinary Beef-tea.

A concentrated preparation is supplied as **Peptonised Beef Jelly.**

PEPTONISED NUTRITIVE ENEMATA.—The enema may be prepared in the usual way with milk-gruel and beef-tea, and a dessertspoonful of Liquor Pancreatis should be added to it just before administration.

In the warm temperature of the bowel the ferments find a favourable medium for their action on the nutritive materials with which they are mixed.

It must be borne in mind that peptonised foods are very liable to change on keeping, and that fresh quantities should be prepared every 12 hours or they must be re-boiled.—*Sir W. Roberts, Lumleian Lectures*, 1880.

PANCREATISED FAT or PANCREATIC EMULSION.

Introduced in the treatment of consumption and other wasting diseases, by Dobell.

Dose.—From 1 to 4 fl. drm. = 3·6 to 14·2 c.c., mixed in Milk or Water, from 1 to 4 times in 24 hours.

Not Official.

PAPAIN.

Syn.—PAPAYOTIN.

A white, or whitish, amorphous powder, soluble in Glycerin. It is a digestive ferment extracted from Papaw Juice (*Carica Papaya*, L.).

Papaw leaves contain an alkaloid **Carpaine**, the **Hydrochloride** of which is readily soluble in Water; it has been used as a heart tonic and febrifuge.

Papain possesses a solvent action on animal proteids, and acts best in neutral or slightly alkaline solution.

Some commercial Papains possess such activity in acid solution that they have been suspected of being admixtures containing Pepsin.

Medicinal Properties.—Its solution (5 p.c.) is stated to dissolve false membrane in diphtheria, and to be a good application to warty epitheliomatous growths.—*B.M.J.* '85, ii. 151; '88, i. 1296; *M.P.* '94, i. 633; *Pr.* li. 372; *B.M.J.E.* '93, ii. 39. Internally in gastric ulcer.—*L.* '94, i. 840; '95, i. 333. In atonic dyspepsia.—*L.* '95, i. 1050. In gastritis.—*B.M.J.E.* '93, ii. 36.

The results of a research (*L.* '05, i. 589) show that Papain contains a fibrin-digesting but not peptolytic proteose of the nature of Pepsin, as well as a peptolytic but not fibrin-digesting proteose of the nature of an erepsin.

Some further importance has recently been attached to this substance by its use in the treatment of malignant growths, attention being drawn to it by the publication of several letters relating to the action of certain other ferments on inoperable cancers. A mass of scirrhus was injected (*B.M.J.* '06, i. 1439) with 2 grains of this substance. Since then, the same procedure was adopted with three tumours of similar nature. These injections were followed by a burning feeling of short duration and then by an occasional gnawing sensation. The tumours softened in a few days, burst, and gave out a copious discharge of thick grey fluid for about a week. When the discharge ceased, the lumps were found to have disappeared or become much smaller. One tumour had to be injected 3 times before it burst. The temperature rose from 2 to 4 degrees, but became normal in 2 or 3 days.

Injections of ½ grain and upwards into malignant growths with good results.—*B.M.J.* '07, i. 135.

Dose.—2 to 10 grains = 0·13 to 0·65 gramme.

Prescribing Notes.—*May be given in* **cachets, mixture, pills,** *or as a* **hypodermic injection.** *A good pill may be made by using 'Dispensing Syrup' q.s. Given also in the forms of* **Elixir** *and* **Glycerole,** *in doses of* 1 *teaspoonful.*

Foreign Pharmacopœias.—Official in Mex.

ELIXIR PAPAIN (*Squire*).—Glycerinum Papain (*Squire*), 8 fl. oz.; Carmine solution, 2 fl. drm.; Spiritus Nucis Juglandis, 2 fl. drm.; Elixir Aurant, sufficient to produce 16 fl. oz.

1 fl. drm. (3·6 c.c.) contains 2½ grains (0·16 gramme) of the purified and dried juice.

Dose.—1 to 2 fl. drm. = 3·6 to 7·1 c.c. twice or thrice daily, half an hour before food.

Papain, 11; Saccharin, 0·4; Glycerin, 60; Sherry, 150; Chloroform Water (1 in 200), 390.—*Hager.*

Papain, 5; Alcohol, 15; Distilled Water, 45; Aromatic Elixir, *q.s.* to produce 100.—*B.P.C.*

GLYCERINUM PAPAIN (*Squire*).—Papain purified and dried, 640 grains; Sodium Bicarbonate powder, 40 grains; Glycerin, 8 fl. oz.; Aqua Dest. sufficient to produce 16 fl. oz.

Papain, 1 oz.; Hydrochloric Acid, 40 minims; Purified Talc, 120 grains; Glycerin, 8 fl. oz.; Water, to 16 fl. oz.—*Pharm. Form.*

Papain, 8; Diluted Hydrochloric Acid, 8; Simple Elixir, 5; Glycerin, *q.s.* to produce 100.—*B.P.C.*

INJECTIO PAPAIN FORT. (*Squire*).—A sterilised limpid liquid possessing the full digestive powers of the purified and dried juice. 1 c.c. (17 minims) contains 2 grains (0·13 gramme) of the purified and dried juice.

Dose.—1 to 2 c.c. = 17 to 34 minims, hypodermically injected deeply into the subcutaneous tissue.

The above injection is prepared in the form of hermetically sealed glass capsules of a dark amber tint, each capsule containing sufficient for an average hypodermic dose.

LOTIO PAPAIN (*Squire*).—A clear permanent solution of the enzymes in a Glycerin basis, prepared for use as a surgical solvent. It may be applied locally undiluted, with a camel's-hair brush.

PAPAVERIS CAPSULÆ.

POPPY CAPSULES.

FR., PAVOT; GER., UNREIFE MOHNKÖPFE; ITAL., PAPAVERO;
SPAN., ADORMIDERA.

The nearly ripe dried Fruits of the Opium Poppy, *Papaver somniferum*, L.

Medicinal Properties.—Similar to Opium, but much weaker and of uncertain strength. The **decoction** is used as a soothing anodyne fomentation.

Not Official.—Decoctum Papaveris, Syrupus Papaveris and Extractum Papaveris Liquidum.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr. (Pavot), Ger., Hung., Mex. (Adormideras), Port. (Dormideiras), Russ., Span. (Adormidera), and Swiss. Not in the others.

Descriptive Notes.—Poppy capsules are usually dried gradually on the plant, the stalk being bent downwards as soon as the poppy head has arrived at its full size, and the capsule is thus allowed to become hard on the plant. The first capsule formed is usually the largest; the subsequent, smaller, capsules are sorted out, and sold separately; and the smallest are usually broken up and sold at a lower price, for making fomentations, etc. There are two forms of the capsules, viz. (1) nearly spherical, and depressed at base and apex, and (2) oblong oval. The seeds are white when derived from the white flowered form, but are often greyish when derived from the red flowered variety of *Papaver somniferum.* The white seeded form is the one official in the *B.P.* The capsule is described as being the nearly ripe dried fruit usually 2 to 3 in. (5 to 7½ cm.) in diameter, and suddenly contracted below into a neck, and covered above with stellately arranged stigmas; the pericarp being pale yellowish-brown externally, and frequently marked with dark spots, and having a bitter taste but no odour. The seeds, and the fixed Oil derived from them, are both official in the *P.G.*, in which the unripe capsules are directed to be cut in half longitudinally and freed from the seeds before use, without which they should weigh 3 to 4 grammes and show dried milky juice at the edges. The seeds are described as reniform, 1 mm. long, with a network of six-sided meshes on the surface. Neither the seeds nor the capsules nor the Oil are official in the *U.S.P.*

Tests.—Poppy capsules yield about 10 p.c. of ash.

Not Official.

DECOCTUM PAPAVERIS.—Poppy Capsules, bruised, 2; Distilled Water, 30; boil 10 minutes in a covered vessel, and strain; then pour over the contents of the strainer as much Distilled Water as will make up the strained product to 20. (1 in 10)

An external soothing application, applied warm.

Foreign Pharmacopœias.—Span., Infusion, 1 in 35.

SYRUPUS PAPAVERIS (*B.P.* '85).—36 of Poppy Capsules is exhausted with boiling Water, and the liquid evaporated to 60; this is treated with 16 of

Alcohol (90 p.c.), and subsequently evaporated to 40, in which is dissolved 64 of Sugar. (1 in nearly 2¼)

Dose.—1 fl. drm. = 3·6 c.c.

On the average, 60 minims will equal 8 minims of Tincture of Opium.

This Syrup can be made from the Liquid Extract (*given below*) by evaporating 80 of the Liquid Extract to 40, and dissolving in it 64 of Sugar.

Liquid Extract (*given below*), 40; Sugar, 70; dissolve and make up to 100.—*B.P.C.*

This is less than half the strength of the preparation given above, but the difference is probably unintentional.

Foreign Pharmacopœias.—Official in Austr. (Syrupus Opiatus.)—Extract Opium 1, Simple Syrup 999. Dutch, Ger. and Russ., 1 in 10; Belg. (Syrupus Opii dilutus), Syrup of Opium 1, Simple Syrup 4. Dan., about 1 in 12; Hung. (Syr. Diacodii) 1 in 27; Ital. (Sciroppo di Oppio), Extract of Opium, 1 in 1000; Mex. (Jarabe diacodio), 1 of Ext. Opii in 2000; Port. (Xarope de Dormideiras), 1 in 13½; Span. (Jarabe de Adormideras), 1 extract in 100; Swiss, Extract of Opium 1, Water 4, Simple Syrup 995. Not in Fr., Ital., Jap., Norw., Swed. or U.S.

EXTRACTUM PAPAVERIS LIQUIDUM.—The liquid obtained by the process for making the Syrup (previous to adding the Alcohol and the Sugar), 3; Alcohol (90 p.c.), 1; mix.

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

This has been incorporated in the *B.P.C.*

PARAFFINUM.

Petroleum Oil and Shale are mixtures of the hydrocarbons of the Paraffin series, some of which are official under the names Paraffinum Durum, Paraffinum Liquidum, Paraffinum Molle. Hard Paraffin is obtained chiefly from Shale, the Liquid and Soft Paraffins from Petroleum.

PARAFFINUM DURUM. Hard Paraffin.

Fr., Paraffine; Ger., Festes Paraffin; Ital., Paraffina; Span., Parafina.

A colourless, crystalline, wax-like solid, which is a mixture of several of the harder members of the Paraffin series.

Solubility.—Insoluble in Water, sparingly soluble in Absolute Alcohol; 1 in 80 of Ether, sp. gr. 0·720; 1 in 140 of Ether, *B.P.*

In *B.P.* '85 it was stated to be 'freely soluble in Ether, which is altered in *B.P.* '98 to 'almost entirely soluble in Ether.'

The solubility in Ether (sp. gr. 0·720) depends upon the m.p. of the Paraffin, a sample, m.p. 120° F., dissolved 1 in 40.

Official Preparation.—Unguentum Paraffini. Contained in Unguentum Creosoti and Unguentum Eucalypti.

Not Official.—Emulsio Paraffini and Massa Paraffinum.

Foreign Pharmacopœias.—Official in Belg., Ger., Hung., Jap. and Russ., all Paraffinum Solidum (m.p. 74° to 80° C.); Dutch m.p. 56° to 60°; Fr., Paraffine (distils between 375° and 435°), m.p. not given; Span., m.p. 44° to 65°; Swiss, m.p. 65° to 80°; U.S., Petrolatum Spissum (m.p. 45° to 48° C.). Not in the others.

Paraffin Injections.—Very frequent references to this method of remedying deformities have been current. An exhaustive paper (*B.M.J.* '04, ii. 1154) shows that the best form of syringe is an all-metal one with a screw piston. The

Paraffin is melted by placing the containing bottle up to its neck in very hot Water. Then it and the syringe are kept in Water about 5° above the m.p. of the Paraffin. The syringe is filled, the needle dipped for a few minutes in very hot Water to prevent the Paraffin from setting in the needle, the needle is inserted well under the skin and the injection made quickly.

Thrombosis is avoided by using screw syringe, so that Paraffin may be injected slowly and steadily.

Ethyl Chloride should not be used to cool the Paraffin, but only a stream of cold Water. The Paraffin used should have a m.p. about 105° F., and the injection should be made about 120° F. About 1 c.c. may be enough in cases of sunken nose. In prolapse of the rectum or the vagina 1 oz., or in bad cases 1½ oz., may be required (*B.M.J.* '04, ii. 1155).

For remedying deformities of the nose an interesting method of procedure is given in the *B.M.J.* '04, ii. 1239. The Paraffin used is a mixture of Hard and Soft Paraffin having a m.p. of 106° F. From an experience of over one hundred cases it has been shown that the operation, if properly performed, is practically devoid of danger.

For external injections a Paraffin liquefying between 45° and 50° C. (113° and 131° F.) should be used (*B.M.J.* '06, i. 1408), while for the treatment of atrophic ozæna cold injection of Paraffin melting at 45° C. (113° F.) should be used.

Some cases of bone cavities treated by stopping with Paraffin method described; Paraffin of a m.p. of 120° F. should be used, *L.* '08, i. 155.

A new syringe, *L.* '07, i. 1612.

Tests.—Hard Paraffin has a sp. gr. according to the *B.P.* from 0·820 to 0·940; the *U.S.P.* gives the sp. gr. at 0·890 to 0·905 at 25° C. (77° F.). It melts according to the *B.P.* at 54·4° to 57·2° C. (130° to 135° F.). The *U.S.P.* m.p. is 51·6° to 57·2° C. (125° to 135° F.). The *P.G.* m.p. is 74° to 80° C. (165·2° to 176° F.). No sp. gr. figure is included in the *P.G.* The *B.P.* states that it melts at the temperature given above, and burns with a bright flame. The *U.S.P.* more correctly states that when strongly heated it ignites and burns with a luminous flame. The *U.S.P.* states that if 0·5 of a gramme of Paraffin be heated in a dry test-tube with 0·5 of a gramme of Sulphur, Carbon is separated and the mixture becomes black, Hydrogen Sulphide gas being simultaneously evolved; no similar test is given in either the *B.P.* or the *P.G.*; all three Pharmacopœias state that an alcoholic Solution should not redden blue Litmus paper.

The more generally occurring impurities are free acid, Stearic Acid, and fixed Oils. The presence of free acid may be shown by the acid reaction of the alcoholic solution, fixed Oils or other organic impurities may be shown by the Sulphuric Acid test described below, and the presence of Stearic Acid by the Fuchsin test described below, and also by the acid nature of the solution in Alcohol (90 p.c. or 94·9 p.c.). It should leave no weighable residue when ignited with free access of air.

Sulphuric Acid.—It should not be acted upon nor coloured by Sulphuric Acid, *U.S.P.* 3 grammes heated on a water-bath with 3 c.c. of Sulphuric Acid in a glass previously rinsed out with warm Sulphuric Acid and carefully agitated for 10 minutes should not be affected and the acid should not be coloured more than faintly brown, *P.G.*

Nitric Acid.—It should not be acted upon nor coloured by Nitric Acid, *U.S.P.*

Fuchsin.—If 0·5 gramme of Paraffin and 0·1 gramme of powdered Fuchsin added to the fused mass, the latter should not assume a pink or red colour, *U.S.P.*

Preparation.

UNGUENTUM PARAFFINI. PARAFFIN OINTMENT.
Hard Paraffin, 3; Soft Paraffin, 7.

At first sight this would appear to be a definite formula, but official permission is given to use White or Yellow Soft Paraffin, to suit the colour of the ingredients with which it may be mixed, and the proportions of the Paraffins may be varied to suit climate and temperature.

Official Preparations.—The **White** is used in the preparation of Unguentum Acidi Borici, Unguentum Acidi Carbolici, Unguentum Acidi Salicylici, Unguentum Glycerini Plumbi Subacetatis, Unguentum Hydrargyri Ammoniati, Unguentum Plumbi Acetatis, and Unguentum Plumbi Carbonatis. The **Yellow** is used in Unguentum Hydrargyi Oxidi Rubri, Unguentum Iodoformi, and Unguentum Plumbi Iodidi.

An Ointment is official in Jap. and Ger. Solid Paraffin 1, Liquid Paraffin 4.

PARAFFINUM LIQUIDUM. LIQUID PARAFFIN.

A colourless, odourless and tasteless, transparent, oily fluid, which is officially required to be 'not fluorescent.'

Solubility.—It mixes with Chloroform, Ether, and the fixed and volatile Oils. It dissolves Bromine, Iodine, Iodoform and Phosphorus.

Medicinal Properties.—It has been used, alone or mixed with Castor or Olive Oil, as an application in chronic eczema accompanied by desquamation. Has been used as a solvent or emulsifier for substances to be given hypodermically or used in sprays and atomisers.

Ordinary lamp Paraffin, applied with a camel's-hair brush to diphtheritic patches (after scraping).—*B.M.J.* '91, ii. 645; '01, i. 1645; '01, 504, 838.

Not Official.—Emulsio Petrolei et Glycerophosphatis, Emulsio Petrolei cum Hypophosphitibus, Oleum pro Nebula.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Ger., and Russ. sp. gr. 0·880; Dutch, not less than 0·860; Fr. (Huile de Vaseline), sp. gr. about 0·875, and Huile Lourdes de Pétrole, sp. gr. 0·880–0·905; Jap., sp. gr. 0·875 to 0·945; Mex. (Vaselina liquida), sp. gr. 0·875 to 0·890; Norw., sp. gr. 0·895 to 0·905; Span. (Aceite de Parafina), sp. gr. 0·840; Swed., sp. gr. 0·88 to 0·90; Swiss, sp. gr. 0·880 to 0·885; U.S., about 0·870 to 0·940 at 25° C. (77° F.).

Paroleine, Oleum Deelinæ, Adepsine Oil, Glymol, Vaseline Oil, Chrismaline, are forms of Liquid Paraffin.

Tests.—Liquid Paraffin has a sp. gr. from 0·865 to 0·890. The *B.P.* gives the sp. gr. from 0·885 to 0·890, but the lower limit has been fixed too high; many good samples have a much lower sp. gr., and some of them in good demand are as low as 0·865. The purification of the Oil from tarry constituents reduces the gravity to 0·882, whilst it is generally reduced to 0·880. The *U.S.P.* gives the sp. gr. of 0·870 to 0·940 at 25° C. (77° F.). The *P.G.* give the gravity of not under 0·880. The *B.P.* and the *P.G.* both give a boiling point of not below 360° C. (680° F.).

The more generally occurring impurities are those of a readily carbonisable organic nature, free acid, Sulphur compounds, and mineral impurity. Free acid, if present, is indicated by the reaction towards blue Litmus paper. The presence of readily carbonisable organic impurities is shown by Sulphuric Acid. A test for these impurities appeared in the first issue of the *U.S.P.*, and read as follows: —If 2 volumes of concentrated Sulphuric Acid be added to 1 volume of liquid Petrolatum in a test-tube placed in hot Water, and the contents occasionally agitated during 15 minutes, the acid should not acquire a deeper tint than brown, nor lose its transparency. The test was evidently considered too stringent, and was deleted in the list of Additions and Corrections (1907). The *B.P.* contains a Sulphuric Acid test, and requires that when equal volumes of the liquid Paraffin and Sulphuric Acid are heated together during 10 minutes at a temperature of boiling Water, and agitated at frequent intervals, the lower acid layer should not acquire a deeper colour than a pale brown. The *B.P.* includes a test with Sodium Hydroxide Solution saturated with Lead Oxide, and requires that when 2 drops of such a solution is mixed with 4 c.c. of liquid Paraffin and 2 c.c. of Absolute Alcohol, the mixture should remain colourless when maintained at 70° C. (158° F.) for 10 minutes. Fixed Oils and Rosin are saponifiable with Potassium or Sodium Hydroxide Solution, their presence may therefore be detected by saponifying a portion of the sample, removing the aqueous layer and acidifying with Sulphuric Acid. The *U.S.P.* employs 10 grammes of the liquid Paraffin for this test and saponifies for half an hour at a temperature of 100° C. (212° F.) with a solution of 10 grammes of Sodium Hydroxide in 50 c.c. of Water. A portion of the sample when carefully heated to remove the more volatile portions and finally ignited with free access of air should leave no weighable residue.

Litmus.—Boiled with Alcohol (an equal volume, *P.G.*) the Alcohol should not redden blue Litmus paper, *B.P.* and *P.G.* Shaken vigorously in a half-filled test-tube with a piece of moistened blue Litmus paper, the paper should not be reddened, *U.S.P.*

Sodium Hydroxide and Sulphuric Acid.—10 grammes digested at 100° C. (212° F.) for 30 minutes with 10 grammes of Sodium Hydroxide and 50 c.c. of Water yields an aqueous layer which, when separated and mixed with Sulphuric Acid in excess should yield no oily or solid substance, *U.S.P.*

Not Official.

EMULSIO PETROLEI ET GLYCEROPHOSPHATIS.—Liquid Petroleum, 2 fl. oz.; Powdered Gum Acacia, 1 oz.; Calcium Glycerophosphate, 24 grains; Magnesium Glycerophosphate, 12 grains; Sodium Glycerophosphate 12 grains; Potassium Glycerophosphate, 12 grains; Citric Acid, 5 grains; Spirit of Chloroform, 2 fl. drm.; Tincture of Lemons, 1 fl. drm.; Elixir of Saccharin, 10 minims; Distilled Water, *q.s.* to produce 6 fl. oz.

Triturate the Petroleum with the Gum and emulsify with 1½ oz. of Water added all at once. Dissolve the Glycerophosphates and Acid in 1 oz. of Water, and add to this solution the other ingredients, then add gradually to the emulsion and adjust the volume to 6 oz. with Water.—*Bournemouth Formulary.*

This appears in the *B.P.C.* with the quantities as below; read ingredients in order written above:—

33, 16·50, 1, 0·50, 0·50, 0·50, 0·20, 4, 2, 1, *q.s.* to produce 100.

EMULSIO PETROLEI CUM HYPOPHOSPHITIBUS.—Mix in a mortar Liquid Paraffin, 8 fl. oz.; Gum Acacia, in powder, 4 oz.; Cinnamon Oil, 24 minims; Tragacanth, in powder, 120 grains. Add in one quantity 6 fl. oz. of Water, and emulsify completely; add Calcium Hypophosphite and Sodium Hypophosphite, of each 192 grains, dissolved in 4 fl. oz. of Water, and finally sufficient

Water to produce 24 fl. oz.—*B.P.C. Formulary* 1901, now incorporated in the *B.P.C.*, adding 1 p.c. by volume of Elixir Glusidi.

OLEUM PRO NEBULA.—Purified White Petroleum Oil, 4 fl. oz.; Balsam of Peru, 40 grains. Digest in a bottle on a water-bath for 10 minutes, and filter when cold.—*Bournemouth Formulary.*

PARAFFINUM MOLLE.—Soft Paraffin.

A semi-solid translucent substance. Either the white or the yellow variety may be used, according to circumstances.

Vaseline, Adepsine, Salvo Petrolia, Chrisma, and Cosmoline are forms of Soft Paraffin.

Solubility.—Insoluble in Water, slightly soluble in Absolute Alcohol, freely in Ether, Chloroform, Benzol, Oil of Turpentine, the fixed and volatile Oils.

Description of a syringe suitable for making hypodermic injections.—*L.* '03, ii. 611; *B.M.J.* '03, ii. 741.

Official Preparations.—Unguentum Paraffini. The **White** is used in the preparation of Unguentum Creosoti, Unguentum Eucalypti and Unguentum Zinci Oleatis. The **Yellow** in Unguentum Hydrargyri Nitratis Dilutum and Unguentum Hydrargyri Oxidi Flavi.

Not Official.—Emulsio Paraffini, Massa Paraffinum, Ceratum Paraffini, Linogenum Spissum, Parenols, Parogens, Vasenol, Vasogen, and Vasolimenta, Petroleum Spirit (Petroleum Ether).

Foreign Pharmacopœias.—Official in Austr., Dan., Jap., Norw., Swed. and Swiss (Vaselinum); Belg. (Paraffina Mollis); Dutch (Vaselinum Album and V. Flavum); Fr. (Vaseline Officinale); Ger. and Russ. (Unguentum Paraffini); Hung., Ital. and Span. (Vaselina); Mex. (Vaselina Solida); U.S. (Petrolatum Molle).

Tests.—Soft Paraffin is officially stated to possess a sp. gr. of 0·840 to 0·870 at the temperature of its m.p. The *U.S.P.* states that it has a sp. gr. of from 0·820 to 0·850 at a temperature of 60° C. (140° F.) The m.p. is given in the *B.P.* as from 35·5° to 38·9° C. (96° to 102° F.) or even somewhat higher. The *U.S.P.* gives the m.p. as between 45° and 48° C. (113° and 118·4° F.).

The more generally occurring impurities are free acid, readily carbonisable organic impurities, fixed Oils, fats, Rosin, and mineral matter. Soft Paraffin is digested with Alcohol (90 p.c.), and the insoluble oily matter separated, the alcoholic solution should be neutral in reaction towards Litmus paper. When mixed with twice its volume of Sulphuric Acid and warmed in a water-bath for 15 minutes the acid should not be coloured more than a light brown; when boiled with Sodium Hydroxide Solution, and the aqueous alkaline liquid separated from the oily residue, should yield no precipitate or oily matter on acidifying with Sulphuric Acid. The *U.S.P.* uses the same test as is described under Liquid Paraffin. A portion of the sample when carefully ignited with free access of air should leave no weighable residue. Paraffin Molle is not official in the *P.G.*

Litmus.—Water shaken with melted Petrolatum should not redden blue Litmus, *U.S.P.*

Sodium Hydroxide.—Digest 10 grammes of Soft Paraffin, 10 grammes of Sodium Hydroxide, and 50 c.c. of Water for half an hour on a water-bath and then separate the aqueous layer. No oily or solid substance should separate from this when it is supersaturated with Sulphuric Acid, *U.S.P.*

Sulphuric Acid.—When 2 volumes of conc. Sulphuric Acid and 1 volume of melted Petrolatum in a test-tube be placed in hot Water for 15 minutes, with occasional agitation, the acid should not acquire a deeper tint than brown nor lose its transparency, *U.S.P.* 1906, but deleted in list of Additions and Corrections 1907.

Not Official.

EMULSIO PARAFFINI. *Syn.* Aseptic Shaving Cream.—Hard Paraffin (m.p. 55° C.), 22; Prepared Suet, 3; Soft Soap, 2; Tragacanth, in powder, 2; Glycerin, 2; Oil of Lavender, 1; Boiling Water, 68. Place the Hard Paraffin and Suet in a vessel surrounded by hot Water, add the Soap and boiling Water and vigorously beat the mixture until a smooth white emulsion is obtained. Remove the surrounding hot Water, and gradually add the Tragacanth, continuing the beating and stirring until the temperature has fallen below 50° C. When nearly cold, add the Glycerin and Oil of Lavender. This product should have the consistence of a soft paste, and is used to facilitate the shaving of skin areas so as to obviate the use of a shaving brush and soap.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

MASSA PARAFFINUM.—Hard Paraffin (m.p. 120° F.), 1; White Soft Paraffin 1½; melt together.

A good mass for making Silver Nitrate and Potassium Permanganate into Pills.

This has been incorporated in the *B.P.C.*

Ceratum Paraffini.—Beeswax, 6; Soft Paraffin, 94.—*B.P.C.*

PARENOL.—It has been shown by A. Kopp (*Apotheker Zeitung*, 19, 786) that Soft and Liquid Paraffin can be formed into stable emulsions with Water by the addition of a small quantity of Wool Fat, Beeswax, Spermaceti or other substances, consisting chiefly of the higher Alcohols or esters of those Alcohols. The resulting emulsions are absorbed readily through the skin, cause no irritation, and do not become rancid, while they serve a useful purpose as vehicles for the application of various medicaments.

The following formulæ are found to yield satisfactory products, the first being somewhat better than the second and third:

Wool Fat Parenol.—Soft Paraffin, 65; Wool Fat, 15; Distilled Water, sufficient to produce 100. Warm the Water, and mix gradually with the melted Soft Paraffin and Wool Fat in a warm mortar.

This has been incorporated in the *B.P.C.*

Beeswax Parenol.—Soft Paraffin, 70; white Beeswax, 5; Distilled Water, sufficient to produce 100. Proceed as in the former case.

Spermaceti Parenol.—Soft Paraffin, 70; Spermaceti, 5; Distilled Water, sufficient to produce 100. Proceed as in the first case.

These solid Parenols are of ointment-like consistence, can be made to take up more than their own weight of Water, mix with all fats, and can be used alone or in combination with other substances.

Liquid Parenol.—Liquid Paraffin, 70; white Beeswax, 5; Distilled Water, sufficient to produce 100. Proceed as in the case of Wool Fat Parenol.

This has been incorporated in the *B.P.C.*

The Liquid Parenol is a neutral liniment, possessing similar properties to the solid preparations, and can be used in the treatment of skin diseases, for lubricating catheters, or as a vehicle for injections.—*P.J.* '06, ii. 623; *Y.B.P.* '07, 278.

VASOGEN (Oxygenated Vaseline. Valsol).—A yellow, or dark brown, thick oily liquid which forms with Water a stable white emulsion. It has been introduced as a basis for various medicated preparations, *e.g.*, Creosote-Vasogen (5 and 20 p.c.), Ichthyol-Vasogen (1 p.c.), Iodene-Vasogen (6 and 10 p.c.), Iodoform-Vasogen (15 p.c.), and Menthol-Vasogen (2 p.c.).

A mixture of Vaseline Oil and Oleic Acid, when saturated with Ammonia, yields a similar preparation to Vasogen.—*Proc. Amer. Pharm. Assoc.* xliii. 632; *P.J.* '02, ii. 259.

A brown fatty solid is also known under the name of **Vasogenum Spissum.**

VASENOL.—A yellow vaseline preparation containing 25 p.c. Water, introduced as an ointment basis; and a **liquid vasenol** (white), which may be medicated as desired, has also been introduced where a creamy application is used. —*B.M.J.* '04, ii. 1414.

A combination of a Liquid Paraffin with a small quantity of the higher Alcohols obtained from Spermaceti, Wool Fat, etc. The product mixes readily with aqueous liquids producing neutral emulsions.—*L.* '05, i. 1396.

VASOLIMENTA.—Under this name (*Pharm. Centr.*, xli. 756) a combined soap hydrocarbon basis for medical inunction has been introduced. *Simple Vasoliment*, or *Liquid Vasoliment*, is prepared by saponifying Oleic Acid, 50, with Alcoholic Ammonia, 25, the soap being heated with Liquid Paraffin, 100, until solution is effected. The weight is then made up to 175 with Alcohol. *Thick Vasoliment* is prepared in a similar manner, but the Alcohol is evaporated off. Medicated Vasoliments are prepared as solutions of the active ingredients in simple Vasoliment in the following percentage proportions respectively: *Salicylic Acid*, 2 p.c.; *Camphorated Chloroform*, Camphor 30 p.c. and Chloroform 30 p.c.; *Iodine*, 6 p.c.; *Ichthyol*, 10 p.c.; *Creolin*, 5 p.c.; *Menthol*, 2 p.c.; *Venice Turpentine*, 20 p.c.; *Iodoform*, 1·5 p.c; *deodorised Iodoform*, Iodoform, 1·5 p.c., Eucalyptol, 1·5 p.c.; *Eucalyptol*, 20 p.c.; *Naphthol*, 10 p.c.; *Guaiacol*, 20 p.c.; *Thiol*, 5 p.c.—*Y.B.P.* '01, 212 and *Hager.*

PAROGENUM. *Syn.* Liquid Parogen; Vasoliment; Oxygenated Paraffin. —Liquid Paraffin, 40; Oleic Acid, 40; Ammoniated Alcohol (5 p.c.), 20.—*B.P.C.*

PAROGENUM SPISSUM. *Syn.* Thick Vasoliment.—Hard Paraffin, 12; Liquid Paraffin, 48; Oleic Acid, 30; Ammoniated Alcohol (10 p.c.), 10; evaporate to 90 by weight.—*B.P.C.*

Vasoliments have been incorporated in the *B.P.C.* under the title Parogeni.

Mindes' Vasoliments.—No. 1: Liquid Paraffin, 35; White Olein, 35; Alcoholic Solution of Ammonia, 25; strong Alcohol, 5. No. 2: Liquid Paraffin, 35; white Olein, 35; Alcoholic solution of Ammonia, 30. The No. 2 formula is recommended for the preparation of a solution of Iodine, or of any other medicament soluble in Ether.

Linogens are obtained by substituting Linseed Oil for Liquid Paraffin in the two preceding formulæ.

Linogenum Spissum.—Linseed Ointment (Linseed Oil, 3, Paraffin, 2), 60; white Olein, 30; Alcoholic solution of Ammonia, 10. Mix intimately in a mortar. The product, of a bright, yellow colour, readily absorbs large quantities of water.

Linogens of Iodine, Creolin, Creosotal, Creosote, Ichthyol, Resorcin and Veratrine are obtained by simple solution of the prescribed quantities of the active ingredient in liquid Linogen. Iodine Linogen containing 6 to 10 p.c. of Iodine, although quite bright when first made, becomes cloudy on keeping, especially if exposed to light.—*P.J.* '02, ii. 415.

PETROLEUM SPIRIT. *Syn.* PETROLEUM ETHER.—Now appears in the Appendix of the *B.P.* '98, and is there described as 'a colourless, very volatile and highly inflammable liquid. Sp. gr. 0·670 to 0·700, boiling point 120° to 140° F.,' and is used as a solvent; the Petroleum Ether for use in conjunction with Methylated Ether (sp. gr. 0·717) for the production of local anæsthesia, has a much lower sp. gr. (0·640), and boils at a much lower temperature.

PARALDEHYDUM.

PARALDEHYDE.

$C_6H_{12}O_3$, eq. 131·10.

FR., PARALDÉHYDE; GER., PARALDEHYD; ITAL., PARALDEIDE;
SPAN., PARALDEHIDO.

A colourless, transparent mobile liquid having a peculiar characteristic, not unpleasant ethereal odour, and a pungent and subsequently a cooling taste. A polymer of Acetaldehyde.

It should be kept in amber-coloured stoppered bottles, and in a cool atmosphere.

Paraldehyde not answering the official requirements can generally be brought up to the standard by washing with Water containing an excess of Sodium Bicarbonate to remove acidity, and then dehydrating over dried Potassium Carbonate. If the m.p. be very low it should first be redistilled and the first tenth rejected.

Solubility.—1 in 8½ of Water at 60° F., the solution becoming very turbid on warming. It is miscible, in all proportions, with Alcohol (90 p.c.) and with Ether.

Medicinal Properties.—Hypnotic. Produces quiet and refreshing sleep more speedily than Chloral; does not depress the heart's action. Has a marked action on the kidneys, increasing the flow of urine. It does not give rise to headache. Is a valuable remedy in the insomnia of cardiac disease, of mania, melancholia, and of other mental diseases.

Paraldehyde is given off by the lungs, and may be detected in the breath 12 or more hours after it has been taken.

30-minim doses every half or one hour in spasmodic asthma.—*B.M.J.* '93, i. 65; '96, i. 725; *L.* '99, i. 756.

In 1 to 1½ fl. drm. doses, one of the most potent remedies in spasmodic asthma.—*Scot. Med. and Surg. Jour.* '99, 418.

One of the best and safest drugs for use as a narcotic in the treatment of mental diseases.—*L.* '02, i. 1539.

Cases of habit have been recorded. Over-doses have occasionally produced epileptiform convulsions, but muscular relaxation and deep stupor are more frequent.—*L.* '03, i. 1023.

Sometimes useful in the sleeplessness of patients suffering from Bright's disease.—*Pr.* lxvii. 658.

Case of poisoning by 1 oz. of pure Paraldehyde given in mistake for a diluted preparation; recovery.—*L.* '02, ii. 673.

Has been successfully employed in the insomnia of tricuspid incompetency. —*M.P.* '04, ii. 515.

A very good hypnotic.—*B.M.J.* '05, ii. 1007. 1½ drm. may be given in 2 oz. of Water, the disagreeable taste being covered by Tincture and Syrup of Orange. It is particularly valuable when insomnia is associated with delirium or any mental aberration.

Of special service as a hypnotic in chronic alcoholism.—*B.M.J.* '05, ii. 250.

In severe bronchopneumonia and capillary bronchitis of infants, with Potassium Iodide and Liquorice.—*B.M.J.* '08 i. 258.

Dose.—½ to 2 fl. drm. = 1·8 to 7·1 c.c.

Ph. Ger. maximum single dose, 5·0 grammes; maximum daily dose, 10·0 grammes.

Prescribing Notes.—*May be taken dissolved in* 1 *to* 2 *fl. oz. of Water. A small dose repeated in an hour is more effective than a large dose. It is very pungent; when prescribed in mixture it should be diluted* 1 *to* 16 *of Water. The flavour is disagreeable and difficult to cover; Tincture of Orange and Cinnamon Water are the best for this purpose. When larger doses than will dissolve are required in mixtures, Compound Tragacanth Powder should be ordered to diffuse it. It is also prescribed in* **capsules.**

It has been stated (*P.J.* '01, i. 559) *that when Potassium Bromide and Paraldehyde are prescribed together in Water, that Potassium Bromate is formed, but we dissolved* 3 *grammes of Potassium Bromide and* 4 *grammes of Paraldehyde in* 150 *grammes of Distilled Water, and on keeping over a month the Bromide titrated its full strength.*

Not Official.—Metaldehyde, and Mistura Paraldehydi.

Foreign Pharmacopœias.—Official in Dan., Hung., Ger., Ital., Jap., Mex. (Paraldeida), Norw., Russ., Span., Swiss and U.S. Not in the others.

Tests.—Paraldehyde has a sp. gr. of 0·998 to 0·999. The *B.P.* gravity is 0·998. A carefully fractionated sample of Paraldehyde may have a sp. gr. of 0·999. The *U.S.P.* sp. gr. is 0·990 at 25° C. (77° F.). The *P.G.* states 0·995 to 0·998. A carefully fractionated sample boils at 125° to 126° C. (257° to 258·8° F.). The *B.P.* boiling point is 124° C. (255·2° F.). The *U.S.P.* gives 121° to 125° C. (249·8° to 257° F.) and the *P.G.* gives 123° to 125° C. (253·4° to 257° F.) as the boiling point. It solidifies to a crystalline mass when cooled to a temperature of about 0° C. (32° F.) and melts again at 10° C. (50° F.). The *B.P.* gives the m.p. as 10° C. (50° F.), the *U.S.P.* as 10·5° C. (51° F.), and the *P.G.* as 10·5° C. (51° F.), but not under 10° C. (50° F.). The m.p. of a carefully fractionated sample is from 12·2° to 12·8° C. (54° to 55° F.).

It is neutral or but faintly acid in reaction towards Litmus paper. When warmed with Silver Ammonio-nitrate Solution the silver is reduced and on standing forms a metallic mirror on the sides of the tube.

The more generally occurring impurities are Aldehyde, Sulphates, Chlorides, free acid and impurities derived from Fusel oil. The *B.P.* has a test for the absence of Aldehyde, requiring that no coloration shall be yielded when the Paraldehyde is mixed with Potassium Hydroxide Solution and allowed to stand for 2 hours. The Aldehyde reaction with Potassium Hydroxide Solution is an exceedingly delicate one, almost too delicate, very few samples remaining quite uncoloured for 2 hours. No similar test is included in the *U.S.P.* or the *P.G.* 1 c.c. of the specimen should form a clear solution with 10 times its volume of Water, which should be free from oily drops (absence of Amyl Alcohol); should yield no turbidity or precipitate with Barium Chloride Solution (absence of Sulphates); when acidified with Nitric Acid should yield no turbidity or precipitate with Silver Nitrate Solution (absence of Chlorides). The absence of any disagreeable odour when the Paraldehyde is carefully and completely evaporated indicates the absence of impurities derived from Fusel oil. The amount of free acid in the sample may be judged by the reaction towards Litmus. The *U.S.P.* and the *P.G.* both give a limit for free acid, the former requiring that a mixture of 8 c.c. of Paraldehyde and 8 c.c. of Alcohol (94·9 p.c.) should acquire a pink colour upon the addition of 0·5 c.c. of Normal Volumetric Potassium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality; the latter that a mixture of 1 c.c. each, of Paraldehyde and Alcohol (90 p.c.), shall not possess an acid reaction after the addition of 1 drop of Normal Volumetric Potassium Hydroxide Solution, but no indicator of neutrality is mentioned. Paraldehyde should be readily and completely volatilised at a temperature of a water-bath, and should leave no weighable residue.

Not Official.

MISTURA PARALDEHYDI.—Paraldehyde, 1 fl. drm.; Glycerin, 40 minims; Rectified Spirit, 2 fl. drm.; Cinnamon Water, to 1 fl. oz.

Metaldehyde, which is also a polymer of Ethylic Aldehyde, occurs in colourless acicular crystals, and was at one time said to be a hypnotic in doses of 2 to 8 grains, but this is doubtful.

PAREIRÆ RADIX.

PAREIRA ROOT.

The dried Root of *Chondrodendron tomentosum*, Ruiz and Pavon.

Under the title of **Cissampelos,** the dried Root of *Cissamapelos Pareira*, L., is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies; also **Decoctum Cissampeli** (1 in 8), dose ½ to 2 fl. oz. = 14·2 to 56·8 c.c.; and **Extractum Cissampeli Fluidum** (1 in 1), dose 30 to 120 minims = 1·8 to 7·1 c.c.

Imported from Rio Janeiro in South Brazil. A spurious Pareira has lately been imported from Bahia in North Brazil, much inferior in alkaloid and extractive. The most marked chemical difference between the two is in the Petroleum Ether Extractive. In the genuine drug this amounts to over 8 p.c., and in the spurious to about 0·3 p.c.—*P.J.* (3) xxii. 703, 771.

A good deal of the stem, which closely resembles the root, is also imported, and is said to be much less efficacious. Several drugs have been sold at different times as Pareira Brava.

Medicinal Properties.—Astringent and mild diuretic in catarrhal affections of the genito-urinary tract, such as gonorrhœa and cystitis.

Official Preparation.—Extractum Pareiræ Liquidum.

Foreign Pharmacopœias.—Official in Mex. and Port. (Butua); U.S. Not in the others.

Descriptive Notes.—Although the Root only is official in the *B.P.*, the stem usually comes with it into commerce, often in the proportion of 3 parts to 1 of root. The root is of a black colour externally, longitudinally furrowed, and marked with transverse ridges. The bark is thin. Internally the root is brownish or yellowish-grey, with several more or less concentric zones having crenated edges, the porous woody wedges being separated by broad medullary rays; it has a waxy surface when cut. It has a bitter taste but no odour. The root is officially limited to pieces ¾ to 2 or more in. (2 to 5 cm.) in diameter. The stem is similar internally, but externally is of a pale greyish colour, with numerous warty, round lenticels. According to Moss the stem contains only three-fourths of the amount of active principle yielded by the root. The true Pareira comes into commerce with considerable irregularity, but its place is taken by inert or false roots all of which have narrower and more numerous zones, which have not, in any case, crenated edges.

Tests.—Pareira Root leaves from 3 to 4 p.c. of ash when ignited with free access of air, and the latter figure should not be exceeded. It has been stated [*P.J.* (3) xxii. 703, 771] to contain about 8 p.c. of fatty matter extractable by Petroleum Ether, but genuine Pareira root and Bahia root obtained from an authoritative source did not yield that amount of Petroleum Ether extract. Samples of Pareira root examined in the author's laboratory yielded on an average 0·5 p.c. w/w of Petroleum Ether extract.

Preparation.

EXTRACTUM PAREIRÆ LIQUIDUM. LIQUID EXTRACT OF PAREIRA.

Pareira Root exhausted with boiling Distilled Water, the liquid evaporated until it contains $33\frac{1}{3}$ p.c. by weight of solid extract, then mixed with one-third of its volume of Alcohol (90 p.c.).

B.P. 1885 prepared the fluid extract from a solid extract.

Dose.—$\frac{1}{2}$ to 2 fl. drm. = 1·8 to 7·1 c.c.

Incompatibles.—Ferric salts, Lead salts, Tincture of Iodine.

Foreign Pharmacopœias.—Official in U.S., 1 in 1 with Glycerin. Not in the others.

Tests.—Liquid Extract of Pareira has a sp. gr. of 1·025 to 1·048; it contains from 12 to 22 p.c. w/v of total solids and about 22 p.c. w/v of Absolute Alcohol.

PEPSINUM.

PEPSIN.

FR., PEPSINE; GER., PEPSIN; ITAL., PEPSINA; SPAN., PEPSINA MEDICINAL.

A proteolytic ferment or enzyme obtained from the mucous lining or the glandular layer of the fresh stomach of the healthy pig, sheep, or calf. The *U.S.P.* admits only the fresh stomach of the hog.

A fine white or yellowish-white amorphous powder, or thin pale yellow or yellowish translucent grains or scales, without any offensive odour, and having a slightly saline taste, followed by a suggestion of bitterness. It should be kept in well-closed glass bottles, as it slowly absorbs moisture when exposed to the air.

B.P. requires it to dissolve 2500 times and *U.S.P.* not less than 3000 times its own weight of freshly coagulated and disintegrated egg albumen.

Solubility.—Soluble about 1 in 100 of Water, more soluble in Water acidulated with Hydrochloric Acid. Insoluble in Alcohol (90 p.c.).

B.P. states that Pepsin is soluble 1 in 100 of Alcohol (90 p.c.), but this can only apply to the 500-test Pepsin of *B.P.* '85, because it consists principally of Sugar of Milk and not Pepsin. It is not true of Pepsin, *B.P.* '98.

Medicinal Properties.—A digestive adjuvant; preferably given with dilute Hydrochloric Acid; used in chronic dyspepsia with deficiency of gastric juice, and in irritability of stomach associated with vomiting and gastralgia. It does not aid the digestion of carbohydrates and fats. It ought to be taken immediately after meals.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Prescribing Notes.—*Given in* **powders,** *or in* **pills** *with 'Dispensing Syrup,' also in* **cachets, capsules,** *and compressed* **tablets.**

Official Preparation.—Glycerinum Pepsini.

Not Official.—Elixir Pepsini, Elixir Pepsini et Bismuthi, Elixir Pepsini et Bismuthi Compositum, Elixir Pepsini et Bismuthi cum Ferro, Elixir Pepsini et Bismuthi cum Podophyllino, Elixir Pepsini et Bismuthi cum Strychnina, Elixir Pepsini et Bismuthi et Strychninæ cum Ferro, Elixir Pepsini et Quininæ, Elixir Pepsini et Quininæ cum Ferro, Glycerole of Pepsin, Glycerinum Pepsini Fortius, Liquor Pepticus, Mistura Pepsini Composita, Mistura Pepsini cum Extracto Malti, Pepsinum Saccharatum, Vinum Pepsini.

The usual solvent for making fluid preparations of Pepsin is a weak Alcohol acidulated with Hydrochloric Acid, to which Glycerin is added.

Alcoholic media are stated to be unsuitable vehicles for pharmaceutical preparations of Pepsin, as even dilute Alcohol in time destroys its activity.—*L.* '02, i. 687; *P.J.* '02, i. 294.

Pepsin is one of the soluble ferments or enzymes of the gastric juice. It dissolves natural proteids, albumens, and fibrin, and converts them into syntonin and subsequently into albumose and Peptone. It is a conversion of the less soluble proteids into those that are more so, Peptone being the most soluble and diffusible of the proteids. Pepsin has no action on starch.

It acts only in acid solution, 0·2 p.c. of Hydrochloric Acid being the most favourable.

The action of Pepsin will continue almost indefinitely if the products of its action are removed by dialysis, or if the concentration of the products is reduced by acidified Water.

The gastric juice also contains another enzyme, 'rennin,' which curdles milk. The curd is formed in acid or neutral solutions in the presence of Calcium Phosphate. The casein is split up into a soluble and an insoluble proteid, the latter of which entangles the fat and forms a curd.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap. (Pepsinum Saccharatum), Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—Pepsin is required by the *B.P.* to dissolve 2500 times its weight of coagulated egg albumen and the following test is adopted for ascertaining that the sample possesses this degree of activity. A weighed quantity of 12·5 grammes of firm coagulated egg albumen prepared by boiling fresh eggs in Water for a quarter of an hour, chilling them in cold Water, separating and washing the whites free from pellicle or yolk, drying with a clean cloth and rubbing the coagulated Albumen through a sieve containing 12 meshes to a cm., is mixed with 125 c.c. of a 0·2 p.c. w/w Hydrochloric Acid Solution. A weighed quantity of 5 mg. of Pepsin is added and the whole digested for 6 hours at a temperature of 40·5° C. (105° F.), the mixture being shaken frequently. The coagulated egg albumen is officially required to dissolve to an almost clear solution leaving only a few small flakes. Care should be taken not to expose the coagulated white of egg to too long a contact with the atmosphere before starting the determination, as the product should be used before it has lost moisture. The above process has been subjected to severe and well-merited criticism; it has been objected that the quantity of 5 mg. is an absurdly small one for the test, and that the *U.S.P.* method of employing an aliquot portion of a solution of Pepsin of a known strength is preferable. The *U.S.P.* now allows the digestion to proceed for 2½ hours instead of for 6 hours, as in the 1890 edition, and give the exact directions as to the number of times and the method by which the liquid is to be agitated, but neither the *B.P.* nor the *U.S.P.* makes any allowance for the solvent action of the acid on the albumen. Allen shows that by only requiring the Pepsin to dissolve the albumen no distinction is drawn between its conversion into Syntonin and true peptonisation. The real digestive power of a Pepsin is measured by the amount of Peptone which it produces in a given time under certain conditions. The conditions of the *U.S.P.* method of experiment afford a determination of the solvent action of the Pepsin on the albumen, although the *U.S.P.* description states that when assayed by such process it shall be capable of digesting the albumen. Allen has worked out a process, which he claims to be an original one for the determination of the digestive power of a Pepsin, whereby the actual amount of Peptone or of mixed Peptones and Albumose produced by digestion is ascertained. The process may be roughly outlined as follows :—A weighed quantity of about 1 gramme of scale egg-albumen is powdered and treated with 20 c.c. of warm Water, and when dissolved is heated in a water-bath to coagulate the albumen and cooled to a temperature not exceeding 40° C. (104° F.); 0·1 of a gramme of a sample of Pepsin to be tested is added, followed by 25 c.c. of Tenth-normal Volumetric Hydrochloric Acid Solution, the mixture is warmed to 40° C. (104° F.) and maintained at this temperature for 3 hours. A volume of Tenth-normal Volumetric Sodium Carbonate Solution exactly equivalent to the Tenth-normal Volumetric Acid Solution previously used is then added and the liquid heated on a water-bath to 90° C. (194° F.) for 10 minutes, it is cooled, diluted with Water to 100 c.c. and passed through a dry filter; the precipitate contains Syntonin and any unaltered albumen, the filtrate containing the Albumose and Peptones. A measured quantity of 50 c.c. is saturated in the cold with Zinc Sulphate (about 60 grammes being required for 50 c.c.) and the mixture is allowed to stand for half an hour with intervals of occasional agitation and filtered, the precipitate washed with cold saturated Zinc Sulphate Solution, diluted with Water to 150 c.c., acidulated with Hydrochloric Acid and treated with Bromine Water, the precipitate is filtered and the Nitrogen determined by Kjeldahl's test, allowance being made for the Nitrogen contained in the Pepsin employed. The method is described in the *Analyst* '97, 258.

The *U.S.P.* Pepsin is required to 'digest' not less than 3000 times its own weight of freshly coagulated and disintegrated egg albumen, and a method of determination of which the following are the essential features is employed:—The coagulated albumen is prepared on somewhat similar lines to the *B.P.*, the coagulated albumen when separated from the pellicle and yolk being rubbed through a clean No. 40 sieve, the first portions passing through being rejected and a weighed quantity of 10 grammes of the succeeding portion transferred to a wide mouthed bottle of 100 c.c. capacity. A measured quantity of 9 c.c. of Diluted Hydrochloric Acid is mixed with 291 c.c. of Water, and in 150 c.c. of this acid liquid a weighed quantity of 1 dg. of Pepsin is dissolved. A measured quantity of 20 c.c. of the Diluted Hydrochloric Acid liquid is added to the 10 grammes of albumen in the bottle and the albumen completely disintegrated by rubbing with a rubber-tipped glass rod, the rod being rinsed with a further quantity of 15 c.c. of diluted acid liquid, and finally a measured quantity of 5 c.c. of the solution of Pepsin is added. After the bottle has been securely corked, it is inverted three times and maintained at a temperature of 52° C. (125·6° F.) for 2½ hours, the bottle being inverted once in 10 minutes. At the end of this time the source of heat is removed, 50 c.c. of cold Water added, the mixture transferred to a narrow graduated cylinder and allowed to remain at rest for half an hour. The *U.S.P.* requires that the precipitate of undissolved albumen should not measure more than 1 c.c. The relative proteolytic power of a stronger or weaker Pepsin may be determined by a series of experiments to ascertain the exact quantity of a Pepsin solution required on the lines prescribed above, to digest the 10 grammes of coagulated and disintegrated egg albumen; the quantity in c.c. of Pepsin Solution required divided into 15,000 gives the number of parts of egg albumen digested by one part of Pepsin.

The *P.G.* test is made on the following lines:—A weighed quantity of 10 grammes of disintegrated egg albumen, prepared from an egg which has been boiled for 10 minutes, and after separation of the yolk, the white has been reduced to a state of coarse powder by rubbing through a sieve, is mixed with 100 c.c. of warm Water of a temperature of 50° C. (122° F.), and a measured quantity of 0·5 c.c. of Hydrochloric Acid added, and finally a weighed quantity of 0·1 of a gramme of Pepsin, the mixture is allowed to stand for 1 hour at 45° C. (113° F.) with repeated intervals of shaking. The *P.G.* requires that, with the exception of a few yellowish-white particles, the albumen shall be completely dissolved.

A method based on the lines of the *U.S.P.* has been suggested (*P.J.* '04, ii. 376.): the solution of Pepsin was prepared by triturating 25 cg. of Pepsin, 1 gramme of Sodium Chloride, and adding acidulated Water very carefully at first, mixing well and transferring to 1000 c.c. flask; the containing vessels being rinsed out with acidulated Water and made up to 1000 c.c., the solution is allowed to stand for 24 hours and shaken at intervals. A measured quantity of 20 c.c. is placed in a stoppered bottle of about 250 c.c. capacity, and 12 grammes of coagulated egg albumen, which has been previously thoroughly reduced to uniform granules by trituration in a small mortar with 50 c.c. of acidulated Water, is added; the last traces of albumen being transferred to the flask with a further quantity of 50 c.c. of acidulated Water, the mixture is digested at a temperature of 45° C. (113° F.) for 6 hours, with intervals of vigorous shaking for 15 minutes.

Preparation.

GLYCERINUM PEPSINI. GLYCERIN OF PEPSIN.

Hydrochloric Acid, 110 minims; Glycerin, 12 fl. oz.; Distilled Water, 6 fl. oz.; Pepsin, 800 grains; macerate for a week, filter and make up with Distilled Water to 20 fl. oz. (1 in 11)

Dose.—1 to 2 fl. drm. = 3·6 to 7·1 c.c., corresponding to 5 to 10 grains = 0·32 to 0·65 gramme of Pepsin.

The Pepsin should be dissolved in the Water, the Glycerin added in 3 or 4 portions, with agitation, then the Acid, and finally made up to volume with Water, and filtered.—*P.J.* '04, i. 84.

Not Official.

PEPSINUM SACCHARATUM.—Pepsin, 1; Sugar of Milk, recently dried and in No. 30 powder, 9.—*U.S.P.* 1890 and *Jap.*

ELIXIR DE PEPSINE.—Pepsin, 2; Distilled Water, 28; Vin de Lunel, 50; Glycerin, 20.—*Fr.*

ELIXIR PEPSINI.—Pepsin, 5; Alcohol, 15; Distilled Water, 45; Aromatic Elixir, *q.s.* to produce 100.—*B.P.C.*

* **ELIXIR PEPSINI ET BISMUTHI.** *Syn.* Bismuth and Pepsine Mixture.—Stronger Glycerin of Pepsin, 12·50; Bismuth and Ammonium Citrate, 3·50; Alcohol (60 p.c.), 5; Simple Elixir, *q.s.* to produce 100. Mix the Glycerin of Pepsin with 10 of the Simple Elixir, and neutralise the mixture carefully with a weak solution of Ammonia. Dissolve the Bismuth and Ammonium Citrate in 50 of the Simple Elixir, aiding solution if acid by neutralising with Ammonia. Finally mix the two solutions, add the Alcohol, make up the required volume with Simple Elixir, and filter. Dose.—½ to 1 fl. drm = 1·8 to 3·6 c.c.—*B.P.C.*

* **ELIXIR PEPSINI ET BISMUTHI COMPOSITUM.**—Stronger Glycerin of Pepsin, 12·50; Bismuth and Ammonium Citrate, 3·50; Morphine Acetate, 0·10; Diluted Acetic Acid, 0·20; Tincture of Nux Vomica, 4; Diluted Hydrocyanic Acid, 2; Alcohol (60 p.c.), 5; Solution of Cochineal, *q.s.*; Simple Elixir, *q.s.* to produce 100. Mix the Glycerin of Pepsin with 10 of the Simple Elixir, and neutralise the mixture carefully with a weak solution of Ammonia. Dissolve the Bismuth and Ammonium Citrate in 50 of Simple Elixir, aiding solution of acid by neutralising with Ammonia. Next mix the Acetic Acid, Alcohol, and 5 of the Simple Elixir, and dissolve the Morphine Acetate in the mixture. Mix the three solutions, add the tincture of Nux Vomica, then the Hydrocyanic Acid, and sufficient Simple Elixir to make up the required volume. Finally colour with the solution of Cochineal, and filter. Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.—*B.P.C.*

* **ELIXIR PEPSINI ET BISMUTHI CUM FERRO.**—Stronger Glycerin of Pepsin, 12·50; Bismuth and Ammonium Citrate, 3·50; Iron and Ammonium Citrate, 3·50; Alcohol (60 p.c.), 5; Simple Elixir, *q.s.* to produce 100.—*B.P.C.*

* **ELIXIR PEPSINI ET BISMUTHI CUM PODOPHYLLINO.**—Stronger Glycerin of Pepsin, 12·50; Bismuth and Ammonium Citrate, 3·50; Podophyllin Resin, 0·25; Aromatic Spirit of Ammonia, 5; Solution of Cochineal, *q.s.*; Simple Elixir, *q.s.* to produce 100.—*B.P.C.*

* **ELIXIR PEPSINI ET BISMUTHI CUM STRYCHNINA.**—Stronger Glycerin of Pepsin, 12·50; Bismuth and Ammonium Citrate, 3·50; Solution of Strychnine Hydrochloride, 2·50; Alcohol (60 p.c.), 5; Simple Elixir, *q.s.* to produce 100.—*B.P.C.*

* **ELIXIR PEPSINI ET BISMUTHI ET STRYCHNINÆ CUM FERRO.**—Stronger Glycerin of Pepsin, 12·50; Bismuth and Ammonium Citrate, 3·50; Solution of Strychnine Hydrochloride, 2·50; Iron and Ammonium Citrate, 2; Alcohol (60 p.c.), 5; Simple Elixir, *q.s.* to produce 100.—*B.P.C.*

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* These formulas closely resemble those previously published in *Armour's Formulary* (9th edit.).

* **ELIXIR PEPSINI ET QUININÆ.**—Stronger Glycerin of Pepsin, 12·50; Quinine Acid Hydrochloride, 1; Alcohol (60 p.c.), 5; Simple Elixir, *q.s.* to produce 100.—*B.P.C.*

* **ELIXIR PEPSINI ET QUININÆ CUM FERRO.**—Stronger Glycerin of Pepsin, 12·50; Iron and Quinine Citrate, 3·50; Alcohol (60 p.c.), 5; Simple Elixir, *q.s.* to produce 100.—*B.P.C.*

ELIXIR PEPSIN ET EUONYMIN. *See* p. 500.

GLYCEROLE OF PEPSIN.—Pepsin, 2 oz.; Diluted Hydrochloric Acid, 1 fl. oz.; Glycerin, 10 fl. oz.; Simple Elixir, 1 fl. oz.; Distilled Water, *q.s.* to produce 20 fl. oz.—*P.J.F.*

GLYCERINUM PEPSINI FORTIUS. *Syn.* Glycerol of Pepsin.—Pepsin, 15; Diluted Hydrochloric Acid, 5; Glycerin, 50; Simple Elixir, 5; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

* **LIQUOR PEPTICUS.**—Stronger Glycerin of Pepsin, 12·50; Diluted Hydrochloric Acid, 2·50; Alcohol, 10; Glycerin, 2·50; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

* **MISTURA PEPSINI COMPOSITA.**—Stronger Glycerin of Pepsin, 5; Solution of Strychnine Hydrochloride, 1·25; Diluted Nitro-Hydrochloric Acid, 3; Glycerin, 10; Tincture of Cudbear, 5; Distilled Water, *q.s.* to make 100.—*B.P.C.*

* **MISTURA PEPSINI CUM EXTRACTO MALTI.** *Syn.* Essence of Pepsin and Malt.—Stronger Glycerin of Pepsin, 5; Extract of Malt, by weight, 30; Alcohol (60 p.c.), *q.s.* to produce 100.—*B.P.C.*; altered in *B.P.C. Supp.*

* **Elixir Simplex.**—Tincture of Orange, 7·50; Syrup, 40; Distilled Water, *q.s.* to produce 100. Mix the Tincture with the Syrup, add sufficient Distilled Water to make up the required volume, and filter through Kaolin.—*B.P.C.*

* **Tinctura Persionis.** Tincture of Cudbear.—Cudbear, in fine powder, 12·50; Alcohol, 35; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

VINUM PEPSINI. Pepsin Wine.—Pepsin, 320 grains; Hydrochloric Acid, 2 fl. drm.; Glycerin, 1 fl. oz.; Sherry, *q.s.* to 20 fl. oz.—*B.P.C. Formulary* 1901, now incorporated in the *B.P.C.*, with 3½ p.c. of Pepsin and using Detannated Sherry, as follows:—

Pepsin, 3·50; Hydrochloric Acid, 1·25; Glycerin, 5; Detannated Sherry, *q.s.* to produce 100.

Official in Austr., Belg., Dutch, Ger. and Russ., about 1 in 40; Jap. about 1 in 20; Mex., 1 in 30; Span., 1 in 20.

Ingluvin.—An amorphous powder, prepared from the gizzard of the domestic fowl. Introduced as a substitute for Pepsin. A stomachic tonic for the relief of indigestion, flatulence and dyspepsia, and of special use in the vomiting of pregnancy.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

PHENACETINUM.

PHENACETIN.

$C_{10}H_{13}NO_2$, eq. 177·80.

Fr., Oxéthylpara-Acétanilide; Ger., Phenacetin; Ital., Fenacetina; Span., Fenacetina.

A white, odourless, almost tasteless, crystalline powder, or white glistening crystalline scales. It is produced by the action of Glacial Acetic Acid upon Para-phenetidin.

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* These formulas closely resemble those previously published in *Armour's Formulary* (9th edit.).

Phenacetin is described in the *U.S.P.* under the title of Acetphenetidin and is stated to be a Phenol derivative, the product of the acetylisation of Para-amidophenetol.

Solubility.—1 in 1700 of Water; 1 in 50 of boiling Water; 1 in 21 of Alcohol (90 p.c.); 1 in 100 of Alcohol (60 p.c.).

Medicinal Properties.—Analgesic, antipyretic and nervine sedative. It does not produce nausea, and it depresses the heart very little, when used judiciously. It is an efficient synthetic analgesic for the relief of neuralgic, rheumatic, locomotor ataxial and other pains; and is the safest of the synthetic antipyretics, being the most free from toxic effects.

As the result of an inquiry as to the ill-effects of Phenacetin, by a Committee of the British Medical Association, it is stated that it appears to have a notable freedom from injurious action, and has great value, especially as an analgesic. Some observers recommend a commencing dose of 5 grains or less, others using doses of 8 to 10 grains.—*B.M.J.* '94, i. 89.

Two cases of temporary rash caused by Phenacetin without any other untoward result.—*L.* '95, i. 91; *C.D.* '95, i. 797.

Palpitation caused in an adult male by taking 3 15-grain powders in 3½ hours. —*Pr.* li. 241; palpitation caused in a female aged thirty-two by taking 5 to 8 cachets of 10 grains each in the 24 hours.—*Pr.* liii. 444.

Phenacetin and Antipyrine are the most trustworthy and valuable of this class of pain-relieving remedies, and if used with due care and judgment, ill-effects following the use of either are exceedingly rare, the principal precaution being to commence with a small dose, of Phenacetin 5 grains and of Antipyrine not more than 10 grains.—*Scot. Med. and Surg. Jour.* '98, ii. 436.

Recommended in influenza to relieve the headache and reduce temperature. —*B.M.J.* '91, i. 1282; '91, ii. 190; '94, ii. 1045.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Ph. Ger. maximum single dose, 1·0 gramme; maximum daily dose, 3·0 grammes.

Prescribing Notes.—*It is given in* **cachets,** *or* **suspended** *in Water with Compound Powder of Tragacanth; in migraine it is usually given with Caffeine in* **effervescent granules.**

Not Official.—Phenacetinum cum Caffeina Effervescens, Amygdophenin, Eupyrine, Kryofin, Lactophenin, Malakin, Para-phenetidin Camphorates and Citrates, Phenosal, Triphenin, Phenocoll Hydrochloridum and Salocoll.

Foreign Pharmacopœias.—Official in Belg., Dan., Dutch, Ger., Jap., Norw., Russ., Swed. and Swiss (Phenacetinum); Austr. and U.S. (Acetphenetidinum); Fr. (Oxéthylpara-Acétanilide); Ital., Mex. and Span. (Fenacetina).

Tests.—Commercial Phenacetin melts at 133·79° C. (272·82° F.), the dried product at 134·26° C. (273·67° F.), and the purified product at 134·89° C. (274·80° F.). The *B.P.* m.p. is 135° C. (275° F.). The *U.S.P.* and *P.G.* m.p. is 134° to 135° C. (273·2° to 275° F.). It dissolves in Sulphuric Acid without change of colour. When 0·1 of a gramme is boiled for from half a minute to 1 minute with 1 or 2 c.c. of Hydrochloric Acid it yields a fluid which, when diluted with 10 times its volume of Water, yields on the addition of 3 or 4 drops of Chromic Acid Solution a deep red coloration. The *U.S.P.* states that it is coloured yellow by Nitric Acid, the colour persisting when heated.

The more generally occurring impurities are Acetanilide, unconverted Para-phenetidin, and mineral matter. The *B.P.* gives only one test for the detection of Acetanilide, requiring that a cold saturated aqueous solution of the sample should not be rendered turbid by the addition of Bromine Solution. This test is also given in the *P.G.* and *U.S.P.* The *U.S.P.* gives three separate tests for Acetanilide: the Potassium Hydroxide test, the Sodium Hydroxide and Chlorinated Soda test, and the Bromine test described in small type below. The Iso-nitrile test is not included; this latter test, when carried out according to the modification described under Acetanilide, is capable of detecting readily an addition of 2 p.c. of the latter substance. An admixture of Acetanilide also affects the m.p.; pure Phenacetin and pure Acetanilide did not begin to fuse at any temperature approaching 92° C. (197·6° F.), whereas mixtures containing from 1 to 95 p.c. of Acetanilide all commenced to fuse at this temperature. Unconverted Para-phenetidin, if present, may be detected by the reddish tint developed on the addition of Volumetric Iodine Solution. The *B.P.* and the *U.S.P.* require that a mixture of 0·3 of a gramme of Phenacetin with 1 c.c. of Alcohol when diluted with 3 times its volume of Water should not acquire a red coloration on boiling with 1 drop of Volumetric Iodine Solution. It may also be detected by the dark red colour produced on the addition of Ferric Chloride T.S. to the saturated aqueous solution of the sample.

Phenacetin when heated with free access of air should leave no weighable residue.

Bromine.—The solution obtained when 0·1 gramme is boiled with 10 c.c. of Water, cooled and filtered, should not be rendered turbid by the addition of a slight excess of Bromine Water, *P.G.* and *U.S.P.*

Potassium Hydroxide.—0·1 gramme, heated with 5 c.c. of a solution of Potassium Hydroxide (1 in 4), should not give off a perceptible odour of Aniline, *U.S.P.*

Sodium Hydroxide and Chlorinated Soda.—Boil 0·1 gramme for 1 minute with 3 c.c. of a solution of Sodium Hydroxide (1 in 2), cool, and agitate the solution with 5 c.c. of solution of Chlorinated Soda. A clear yellow liquid should be obtained, and not a purplish-red or brownish-red cloudy liquid or precipitate, *U.S.P.*

Not Official.

PHENACETINUM CUM CAFFEINA EFFERVESCENS.—Sodium Bicarbonate, 46; Tartaric Acid, 24; Citric Acid, 16; Refined Sugar, 16½; Phenacetin, 5; Caffeine Citrate, 2½; make into granules of a suitable size.—*B.P.C. Formulary* 1901. (about 5 in 100)

This has been incorporated in the *B.P.C.*, but the Caffeine is reduced to 1½ and the Sugar to 16; *B.P.C. Supp.* has altered the Citric Acid to 18, and the Sugar to 15½.

Dose.—60 to 120 grains = 4 to 8 grammes.

AMYGDOPHENIN (Para-phenetidin Amygdalate).—A greyish-white, voluminous, crystalline powder, very sparingly soluble in Water. Antirheumatic and antineuralgic, but of little value as an antipyretic.—*P.J.* '96, i. 139, 162; *B.M.J.E.* '95, ii. 99.

Dose.—8 to 15 grains = 0·52 to 1 gramme.

CITROPHEN (Para-phenetidin Citrate).—A white powder, with an acid reaction; soluble 1 in 165 of Water; 1 in 300 of Alcohol (90 p.c.); insoluble in Ether and in Chloroform. Antipyretic and analgesic, sometimes causing considerable sweating.

Useful in rheumatism of the joints and muscles, in the severe headache of influenza, and in acute tonsillitis.—*B.M.J.E.* '99, ii. 52.

Dose.—7½ to 15 grains = 0·5 to 1 gramme.

Tests.—Citrophen possesses a m.p. of about 181° C. (357·8° F.). A small quantity, when boiled with Hydrochloric Acid, cooled, and the solution diluted with Water, yields a liquid which acquires a deep reddish colour on the addition of Chromic Acid Solution. When ignited with free access of air it should leave no weighable residue.

Citrophen is dibasic, and Apolysin is monobasic, Para-phenetidin Citrate.

Apolysin forms yellowish-white crystals, or a crystalline powder, with an acid reaction; readily soluble in Water. Has been used as an antipyretic and analgesic.

EUPYRINE (Para-phenetidin-vanillin-ethyl Carbonate).—Pale, greenish-yellow crystals, insoluble in Water, readily soluble in Alcohol (90 p.c.), in Ether and in Chloroform. Introduced as an innocuous antipyretic.—*P.J.* '01, ii. 312; *C.D.* '01, i. 36.

Dose.—15 to 20 grains = 1 to 1·3 grammes.

KRYOFIN (Para-phenetidin Methylglycollate).—White, odourless, tasteless crystals, sparingly soluble in cold Water. Antipyretic and analgesic. Useful in neuralgia. Severe sweating sometimes follows its use.—*B.M.J.E.* '97, i. 83; '97, ii. 88; *L.* '97, ii. 728; *P.J.* '97, ii. 5.

Dose.—8 to 15 grains = 0·52 to 1 gramme.

LACTOPHENIN (Para-phenetidin Lactate).—A white, inodorous, bitter, crystalline powder, sparingly soluble in Water.

Medicinal Properties.—Antipyretic, analgesic and hypnotic. Used in migraine, erysipelas, nervous headache and the neuralgia of influenza.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Tests.—Lactophenin melts at about 118° C. (244·4° F.). 0·1 gramme boiled with 1 c.c. of Hydrochloric Acid, the solution cooled and diluted with 10 c.c. of Water and filtered yields, on the addition of 1 or 2 drops of Chromic Acid Solution, a deep red coloration. It dissolves in Sulphuric Acid without change of colour. When ignited with free access of air it should leave no weighable residue.

MALAKIN (Para-phenetidin Salicylate).—Occurs in pale yellow, silky needles, or a yellow, crystalline powder, insoluble in Water and strong Alcohol.

Antipyretic, analgesic and antirheumatic. Used in acute rheumatism, the fever of phthisis, migraine and neuralgia.—*M.P.* '94, i. 268; *B.M.J.E.* '93, ii. 92; '94, i. 84; '94, ii. 88; *T.G.* '95, 325; *Pr.* liii. 45; *Y.B.P.* '95, 89; *Y.B.T.* '95, 89; in every way inferior to Phenacetin and Antipyrine.—*B.M.J.* '98, ii. 1055.

Dose.—10 to 20 grains = 0·65 to 1·3 grammes.

PARA-PHENETIDIN CAMPHORATE.—A white, crystalline powder, insoluble in Water, soluble in Alcohol (90 p.c.). Introduced as an antipyretic.

PHENOSAL (Para-phenetidin Aceto-salicylate).—A white, odourless, crystalline powder, sparingly soluble in Water, in Alcohol (90 p.c.) and in Ether. It is stated to possess antipyretic and antineuralgic properties.—*P.J.* '99, ii. 11, 62.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Triphenin.—A derivative of Para-phenetidin and Propionic Acid; dose, 8 to 15 grains. **Phesin,** a sulpho-derivative of Para-phenetidin, and **Pyrantin,** a derivative of Para-phenetidin and Succinic Acid, dose 5 to 10 grains, have been recommended as antipyretics. **Chinaphenin** (Para-phenetidin-quinine-ethyl Carbonate), dose 5 to 15 grains, and **Para-phenetidin Agarate** have been introduced as antipyretics.

PHENOCOLL HYDROCHLORIDUM.—A white, crystalline powder, soluble 1 in 16 of Water, sparingly soluble in Alcohol (90 p.c.). Obtained by the action of Glycocoll on Phenetidin.

Medicinal Properties. Antipyretic, yielding good results in rheumatic fever.—*L.* '91, i. 1060; '92, ii. 438. As a substitute for Quinine in malaria, *B.M.J.E.* '93, ii. 104; *T.G.* '98, 334, 618; in acute rheumatism, typhoid, malaria, and as an intestinal antiseptic, *B.M.J.E.* '94, i. 79; '96, ii. 83; *L.* '97, i. 1227; *P.J.* '96, i. 178; used in 400 cases of influenza during an epidemic, and found to be a specific.—*P.J.* '99, ii. 216.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Salocoll (Phenocoll Salicylate), recommended in rheumatism in doses of 15 to 30 grains = 1 to 2 grammes. It is not so soluble in Water as the Hydrochloride.

PHENAZONUM.

PHENAZONE.

$C_{11}H_{12}N_2O$, eq. 186·77.

FR., ANTIPYRINE; GER., PHENYLDIMETHYLPYRAZOLON; ITAL., ANTIPIRINA; SPAN., ANTIPIRINA.

Colourless, odourless, crystalline scales, or as a white, neutral, odourless powder, possessing a somewhat bitter taste.

B.P. states that 'Phenazone is commonly known as Antipyrine,' but it is not very clear from this note whether it is intended that Phenazone should be used when Antipyrine is ordered, or that Antipyrine should be used when Phenazone is ordered, or whether it is an incidental note having no meaning.

It appears in the *U.S.P.* under the title of Antipyrina, and is stated to be obtained by the condensation of Phenylhydrazine with Aceto-acetic Ether and subsequent methylation.

Solubility.—1 in 1¼ of Water; 3 in 4 of Alcohol (90 p.c.); about 5 in 6 of Chloroform; 1 in 40 of Ether.

Medicinal Properties.—Antipyretic and analgesic, nervine sedative. It will reduce temperature in all forms of febrile disease, but in weak subjects its depressant effect should be borne in mind.

As an analgesic it is used with great success in neuralgia, migraine, gout, rheumatism, locomotor ataxia and other painful affections, and is frequently given with Sodium Salicylate and Caffeine.

It is a good uterine sedative; it also relieves sea-sickness.

As a pain-relieving remedy Phenacetin is preferred by some, as it is less likely to produce toxic effects.

Of great value as a sedative in some of the nervous disturbances of childhood. —*Pr.* '07, i. 540.

10 p.c. solution locally in epistaxis.—*M.A.* '94, 253; *L.* '93, ii. 453. As a styptic and antiseptic.—*B.M.J.E.* '95, i. 28; *L.* '95, i. 1453. In Tannic Acid Solution as a styptic.—*B.M.J.E.* '95, ii. 90. One of the most pleasant and rapid remedies for influenza.—*Pr.* liv. 383. Discussion on its benefits and risks as an analgesic.—*B.M.J.* '98, ii. 1054; it is contra-indicated in cardiac weakness and cases of extreme exhaustion.—*T.G.* '89, 457.

As the result of an inquiry as to the ill-effects of Phenazone, by a Committee of the British Medical Association, it is stated that the commencing dose should not exceed 10 grains, and should not be repeated too frequently; there is a necessity for watching its action, but ill-effects are not of the frequency or importance ascribed to them by a widespread impression. The large majority of observers agree in stating that they are of no importance whatever, and that, with reasonable and judicious care, they limit in no way the general usefulness of the drug as a therapeutic agent.—*B.M.J.* '94, i. 88.

Toxic symptoms following the administration of 10 grains dissolved in 1 oz. of Water; recovery.—*B.M.J.* '99, ii. 85.

Dose.—5 to 20 grains = 0·32 to 1·3 grammes.

Swiss, maximum single dose, 2·0 grammes; maximum daily dose, 6·0 grammes.

Prescribing Notes.—*Given in* **solution** *with Tincture of Orange and Spirit of Chloroform or Chloroform Water; or in* **powders, cachets, capsules,** *or in the form of* **effervescent granules.**

Incompatibles.—Spiritus Ætheris Nitrosi, Tannic Acid in aqueous solutions, Extractum Cinchonæ Liquidum, and other astringent decoctions and infusions. Chloral Hydrate is not incompatible with Phenazone in moderately dilute aqueous solution. Sodium Salicylate is not incompatible with Phenazone in aqueous solution, but forms an oily liquid if the *solids* be mixed and exposed to the air.—*P.J.* (3) xx. 861.

The incompatibility of Antipyrine and Spiritus Ætheris Nitrosi may be overcome by prescribing them with Sodium Bicarbonate.—*A.J.P.* '94, 321; *C.D.* '98, i. 357.

Not Official.—Pulv. Phenobrom. Co., Phenazonum Effervescens, Acetopyrine, Ferripyrin, Hypnal, Iodopyrin, Migrainine, Pyramidon, Pyramidon Camphorates and Salicylate, Salipyrin, Tolypyrin, Tolysal and Tussol.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Hung., Ital., Jap., Mex., Norw., Russ., Span., Swed., Swiss and U.S. (Antipyrinum); Ger. (Pyrazolonum Phenyldimethylicum).

Chloroform extracts Antipyrine from alkaline solution, but imperfectly from acid solution.

Tests.—Commercial Phenazone melts at 109·12° C. (228·42° F.), dried Phenazone melts at 110·01° C. (230·02° F.), and purified Phenazone melts at 112·84° C. (235·11° F.). The *B.P.* states about 113° C. (235·4° F.); the *U.S.P.* and *P.G.* state that it melts at 113° C. (235·4° F.). The *Fr. Codex* gives 114° C. (237·2° F.) as the m.p. 5 c.c. of an aqueous 1 p.c. solution of Phenazone when mixed with 5 c.c. of Nitric Acid, develops a yellow colour which, on warming, changes to crimson. 12 c.c. of a solution of similar strength, when mixed with 1 decigramme of Sodium Nitrite, yields an almost colourless fluid which, on the addition of 1 c.c. of Diluted Sulphuric Acid, assumes a deep green colour. In the place of Sodium Nitrite, a few drops of Spiritus Ætheris Nitrosi may be used, and will answer the same purpose. A very dilute solution affords, with Ferric Chloride T.S., a deep red coloration, the colour being destroyed by an excess of diluted Sulphuric Acid. The *U.S.P* and *P.G.* recommend the use of 2 c.c. of a 1 in 1000 Phenazone solution and 1 drop of Ferric Chloride T.S. The *B.P.* states that the colour is nearly destroyed by excess of diluted Sulphuric Acid. The *U.S.P.* and *P.G.* that it is changed to light yellow on the addition of 10 drops of Sulphuric Acid. The aqueous solution affords with Tannic Acid an abundant white precipitate; the *B.P.* states that a 5 p.c. aqueous solution affords with Mercuric Chloride T.S. a white precipitate, disappearing on boiling but reappearing on cooling. 2 c.c. of a 1 p.c. aqueous solution yields on the addition of 2 drops of Fuming Nitric Acid a green coloration, changing to red on boiling. The test is common to the *B.P.* and the *P.G.*, but is not in the *U.S.P.* In an acidified aqueous solution it yields a precipitate with Mayer's reagent, and also with Iodo-potassium Iodide (Wagner's) Solution, in a similar way to an alkaloid. It may be extracted from alkaline solution by Chloroform, but is only imperfectly extracted from an acid solution. The *Fr. Codex* (1908) gives a method by which Antipyrine may be determined:—A weighed quantity of 0·5 of a gramme dissolved in 50 grammes of Water is mixed with 1·5 grammes of Sodium Acetate, and after having been brought to the boiling point is mixed with Iodo-potassium Iodide Solution (4 grammes of Iodine and 2 grammes of Potassium Iodide dissolved in 10 grammes of Water and diluted with Water to 100 grammes), until the boiling liquid just commences to become coloured; when cooled the crystallised Iodine compound is separated, dried and weighed; 1 gramme represents 0·7 of a gramme of Antipyrine. It should be free from acids and alkaloids, as indicated by the behaviour of its aqueous solution towards Litmus paper. Its aqueous solution should not be affected by Hydrogen Sulphide, and it should be free from Acetanilide. Neither the *B.P.* nor the *P.G.* includes a specific test for Acetanilide; the *U.S.P.* employs the Iso-nitrile test as described in the small type below. When ignited with free access of air it should leave no weighable residue.

Hydrogen Sulphide.—The aqueous solution should not be affected by T.S. of Hydrogen Sulphide, *B.P.* and *P.G.*

Iso-nitrile Test.—If 0·1 gramme be warmed with Sodium Hydroxide, Chloroform added and again warmed, the disagreeable odour of Phenyl-isocyanide should not be developed, *U.S.P.*

Not Official.

PULV. PHENOBROM. CO. (*Squire*).—A granular effervescent preparation, containing 5 grains of Phenazone, with Sodium Salicylate, Potassium Bromide, and Caffeine, in the tablespoonful dose.

PHENAZONUM EFFERVESCENS.—A granular effervescent preparation, containing 8 grains of Phenazone in 100.—*B.P.C. Formulary* 1901.

Dose.—60 to 120 grains = 4 to 8 grammes.

This has been incorporated in the *B.P.C.* under the title Antipyrina Effervescens; it also includes Antipyrina Effervescens cum Caffeina, containing, in addition, 1·5 grains in 100 of Caffeine Citrate.

The general composition is similar to that given under Phenacetin Effervescens.

ACETOPYRINE (Antipyrine Aceto-salicylate).—A white, crystalline powder, sparingly soluble in Water, readily soluble in Alcohol (90 p.c.), possessing antipyretic and analgesic properties; recommended in rheumatism and neuralgia, and as a good antipyretic having no injurious action on the heart.—*M.P.* '04, ii. 466.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

FERRIPYRIN.—A compound of Antipyrine and Ferric Chloride, containing about 64 p.c. Antipyrine. Occurring as an orange-red powder, soluble in Water. In 20 p.c. solution it has been found useful as a styptic. Useful in chlorosis and anæmia.—*B.M.J.* '95, i. 1382; *L.* '95, i. 1320; *B.M.J.E.* '95, i. 44; as analgesics, Ferripyrin, Tolypyrin and Pyramidon appear to be neither beneficial nor harmful, and are therefore of no therapeutic value for the relief of urgent pain.—*Scot. Med. and Surg. Jour.* '96, iii. 442.

Dose.—Usually 5 grains = 0·32 gramme.

HYPNAL.—Is a crystalline compound of Antipyrine with Chloral Hydrate, readily soluble in Water, has been recommended as a hypnotic; used in simple insomnia, delirium tremens and maniacal excitement.—*Pr.* 1. 297; in the insomnia due to neuralgia or migraine, or the pyrexia of phthisis.—*M.P.* '94, i. 267.

Dose.—10 to 20 grains = 0·65 to 1·3 grammes.

It possesses the depressing action on the heart of both Antipyrine and Chloral Hydrate.

IODOPYRIN.—Colourless, glistening, prismatic needles, or as a white, crystalline powder, sparingly soluble in Water, soluble in Alcohol (90 p.c.). Antipyretic and antiseptic. Has been given in puerperal fever, and has been found useful in acute articular rheumatism.—*B.M.J.E.* '00, i. 12.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Bromopyrin has also been given in the same doses as an antipyretic.

MIGRAININE.—A registered name for a double Citrate of Caffeine and Antipyrine. A white, odourless powder, soluble in Water. Has been found useful in migraine and in neuralgia.—*C.D.* '95, i. 3; *P.J.* '97, ii. 18.

Dose.—7½ to 15 grains = 0·5 to 1 gramme.

Official in Austr. and Swiss, Antipyrinum Caffeina-citricum.

PYRAMIDON (Dimethyl-amido-antipyrin).—A yellowish-white, tasteless, crystalline powder, readily soluble in Water and in Alcohol (90 p.c.). It is official in *Fr. Codex* (1908) under the title of **Diméthylamino-antipyrine,** $C_{13}H_{17}N_3O$.

Dose.—As an analgesic, 10 grains = 0·65 gramme; as an antipyretic, 3 to 5 grains = 0·2 to 0·32 gramme.—*B.M.J.E.* '97, ii. 7, 84; '00, i. 56.

5 grains several times daily in asthma, especially when of reflex origin.—*P.J.* '03, i. 340.

In typhoid fever 5 to 6-grain doses regularly night and day, every 2 hours, until temperature keeps down without it; in severe cases 6 grains, in mild 3 grains.—*B.M.J.E.* '03, ii. 23.

4 grains repeated in half an hour caused marked reduction in temperature in typhoid fever.—*B.M.J.E.* '03, ii. 79.

In 10 to 15-grain doses 3 or 4 times daily is of great value (*B.M.J.E.* '05, i. 72; '07, ii. 3) in the treatment of typhoid when there is no contra-indication.

Tests.—Pyramidon melts at about 108° C. (226·4° F.), and this m.p. is given in *Fr. Codex.* The aqueous solution affords, on the addition of Ferric Chloride T.S., a bluish-violet coloration; and on the addition of Sodium Nitrite and diluted Sulphuric Acid, and also on the addition of Fuming Nitric Acid, it affords a fluorescent bluish-violet coloration. *Fr. Codex* requires that a weighed quantity of 0·5 gramme dissolved in 50 c.c. of Water should, if pure, neutralise 21·75 c.c. of Normal Volumetric Sulphuric Acid Solution, whilst a similar weight of the official salt should neutralise more than 20 c.c.; Methyl Orange Solution being used as an indicator of neutrality. The solution intended is evidently Deci-normal. When heated with free access of air it should leave no weighable residue.

Pyramidon Mono- and **Bi-Camphorate** and **-Salicylate.**—The two former are antipyretics and anhidrotics in doses of 5 to 10 grains; the latter has been found useful in subacute and chronic rheumatism, also in doses of 5 to 10 grains = 0·32 to 0·65 gramme. All occur as white crystalline powders. The urine of patients taking Pyramidon is stated (*P.J.* '05, i. 270) to contain a new acid—Rubazonic Acid—which forms crystalline needles insoluble in Water.

SALIPYRIN. Antipyrine Salicylate $C_{11}H_{12}N_2O$ $C_7H_6O_3$, eq. 323·78.—Hexagonal crystals, or a white, crystalline, odourless powder; soluble 1 in 240 of Water, soluble 1 in 4 of Alcohol (90 p.c.).

In uterine hæmorrhage, *B.M.J.E.* '93, ii. 82; *L.* '95, i. 1005; *P.J.* '95, ii. 363; a specific for influenza, *Y.B.T.* '95, 454; *B.M.J.E.* '93, ii. 103; in peliosis rheumatica, *B.M.J.E.* '97, i. 44; analgesic in painful rheumatic conditions, *B.M.J.* '98, ii. 1055.

Dose.—10 to 30 grains = 0·65 to 2 grammes.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Jap., Russ., Swed. and Swiss.

Tests.—Antipyrine Salicylate melts at 92° C. (197·6° F.). The *P.G.* states 91° to 92° C. (195·8° to 197·6° F.), the *Fr. Codex* 91° C. (195·8° F.). A saturated aqueous solution affords, on the addition of a few drops of Fuming Nitric Acid, a green coloration, and with Tannic Acid Solution, a white precipitate; with Ferric Chloride T.S. a deep red coloration, changing, when largely diluted, to a reddish-violet colour. 0·5 of a gramme mixed in 15 c.c. of Water and heated with 1 c.c. of Hydrochloric Acid affords a clear, colourless solution, from which fine white needles separate on cooling, which, when separated, washed with Water and dried, possess the m.p. and conform to the tests given under Acidum Salicylicum. A saturated aqueous solution of the salt shall not be affected by Hydrogen Sulphide; when warmed with Sodium Hydroxide Solution, and again warmed after the addition of Chloroform, no disagreeable odour of Phenyl-isocyanide should be developed. It should leave no weighable residue when ignited with free access of air.

TOLYPYRIN.—A body allied to Antipyrine (Phenazone), readily soluble in Water, and in Alcohol (90 p.c.); insoluble in Ether.

Antipyretic and analgesic; has been given in acute rheumatism.—*L.* '94, ii. 991; *Pr.* l. 383. *See* also under 'Ferripyrin.'

Dose.—5 to 20 grains = 0·32 to 1·3 grammes.

Tolysal (Tolypyrin Salicylate), sparingly soluble in Water, has been given in similar doses.

Tussol (Antipyrine Amygdalate).—In white granular crystals. Dose, for whooping-cough in young children, 1 to 2 grains; older children may take as much as 7 grains. It should not be taken with Milk.—*L.* '95, i. 1452; *P.J.* (3) xxv. 912, 958.

PHENOL.

See ACIDUM CARBOLICUM.

Not Official.

PHENOLPHTHALEÏN.

DI-HYDROXY-DIPHENYL-PHTHALIDE. DIHYDROXY-PHTHALOPHENONE.

$C_{20}H_{14}O_4$, eq. 315·72.

In small, odourless crystals, or as a pale yellowish-white powder, almost insoluble in Water, readily soluble in Alcohol (90 p.c.). For a long time it has been used as an indicator of neutrality in volumetric analysis, and is of interest from the magnificent pink coloration which its solution acquires by the action of alkalis. The weakest acids, on the other hand, destroy the colour. In recent years it has been found to possess a distinct aperient action, and has been introduced as an aperient under various names, Purgen, Aperione, etc. It may be administered in tablet form in doses of from 1 to 5 grains, and as a lozenge with chocolate basis containing 2 grains. If given to patients who suffer from hæmorrhoids a few doses have been shown (*B.M.J.* '05, i. 302) to produce an attack, and if the piles are troublesome at the time, they are aggravated, and often bleed freely.

Tests.—Phenolphthaleïn melts at from 250° to 253° C. (482° to 487·4° F.). It dissolves readily in Alcohol with the formation of a colourless solution, which is neutral in reaction. The addition of Potassium or Sodium Hydroxide Solution to an alcoholic solution affords a magnificent pink coloration, which is destroyed on the addition of a slight excess of acid. The pink coloration produced with Sodium or Potassium Hydroxide Solution is permanent until the alkali Hydroxide is converted into a neutral salt and the neutralising acid preponderates; it is therefore employed largely as an indicator of neutrality, and is the most trustworthy indicator for the determination of organic acids. The pink coloration produced by an alkali Hydroxide is destroyed by boiling with powdered Zinc; it is also destroyed by moist Carbonic Anhydride. Ammonia affords at first a pink coloration, but the colour is by no means permanent, and the substance does not therefore accurately indicate the point of neutralisation of Ammonia with an acid. 0·5 of a gramme when ignited with free access of air should leave no weighable residue.

NOSOPHEN (Tetra-iodophenolphthaleïn).—A yellow, odourless powder, insoluble in Water, soluble in Ether and in Chloroform. Intestinal antiseptic. Introduced as a substitute for Iodoform.

Dose.—5 grains = 0·32 gramme.

ANTINOSIN (Sodium Tetra-iodophenolphthaleïn).—Blue prismatic crystals or blue amorphous powder, soluble in Water and in Alcohol (90 p.c.). Antiseptic. A substitute for Iodoform.

Dose.—5 grains = 0·32 gramme.

EUDOXIN (Bismuth Tetra-iodophenolphthaleïn).—A reddish-brown, odourless powder, insoluble in Water. Introduced as a gastric and intestinal antiseptic.

Dose.—3 to 8 grains = 0·2 to 0·52 gramme.

Not Official.

PHLORIDZIN.

$C_{21}H_{24}O_{10}$, $2H_2O$, eq. 468·67.

A glucoside, obtained from various Rosaceous trees.

A light, crystalline powder, whitish, or pale yellow, slightly soluble in Water, 1 in 4 of Alcohol (90 p.c.).

A crystalline principle obtained from the bark of the stem and the root of the Cherry and some other allied trees.

It possesses the remarkable property of inducing artificial glycosuria in man and animals to which it is administered (*B.M.J.* '04, ii. 890), and is of value as a test of renal inadequacy; but it is, of course, necessary to determine whether Glucose is already present in the urine, as if it is the test is inapplicable. The test consists in injecting subcutaneously 5 mg. of Phloridzin dissolved, by the aid of Sodium Carbonate, in 20 to 80 minims of Water, immediately after the patient has emptied the bladder. If the kidneys are adequate, Glucose should appear in the urine in half an hour, when the amount may be estimated by Fehling's or by Pavy's method.

Dose.—5 to 15 grains = 0·32 to 1 gramme, in **mixtures,** or in **pills** with 'Diluted Glucose.'

Official in Mex. (Floridcina).

Tests.—Phloridzin loses at 100° C. (212° F.) its Water of crystallisation, which is theoretically equivalent to 7·6 p.c. According to Von Hager it melts at 107° C. (224·6° F.), again solidifies at 130° C. (266° F.), and again melts at 170° C. (338° F.), assuming at 200° C. (293° F.) a red colour, being decomposed with the formation of Rufin. When heated with dilute mineral acids it is decomposed, and the neutralised solution affords with Potassio-cupric Tartrate Solution a red precipitate. It dissolves in concentrated Sulphuric Acid, with the production of a yellow colour, changing to red at a temperature between 25° and 50° C. (77° and 122° F.). When dissolved in an excess of Ammonia Solution and kept in contact with the air it gradually develops a violet or blue coloration. When heated with free access of air it should leave no weighable residue.

PHOSPHORUS.

PHOSPHORUS.

P, eq. 30·80.

Fr., Phosphore blanc; Ger., Phosphor; Ital., Fosforo; Span., Fosforo.

A colourless, or pale yellowish, almost translucent, waxy solid, having a characteristic, disagreeable odour. It rapidly oxidises on exposure to the air, and should be preserved under the surface of Water in well-stoppered bottles, away from the light and in a cool place. In the air it is luminous in the dark.

Solubility.—Slightly soluble in Absolute Alcohol; 1 in 200 of Ether; 1 in 25 of Chloroform; 2 in 1 of Carbon Bisulphide; about 1 in 60 of Olive Oil; 1 in 60 of Oil of Turpentine; also in melted fats. Insoluble in Water.

Medicinal Properties.—Given, but with doubtful success, as a nervine tonic, as an aphrodisiac, in rickets and in osteomalacia. Its prolonged use affects the structure of bones, causing them to become more dense; it also affects the liver and kidneys, leading to fatty degeneration. The preparations are **Oleum** and **Pilula**, and it has been combined with Cod-Liver Oil and other menstrua; should be given with caution, as gastritis may be set up.

Sodium and Calcium Hypophosphites are forms of giving loosely-combined Phosphorus.

Dose, *in pill or solution.*—$\frac{1}{100}$ to $\frac{1}{50}$ grain = 0·0006 to 0·0013 gramme.

Ph. Ger. maximum single dose, 0·001 gramme; maximum daily dose, 0·003 gramme.

Prescribing Notes.—*Generally given in pill form, to which may be added other tonics, such as Iron, Quinine and Strychnine; also dissolved in Almond Oil and Cod-Liver Oil.*

It should always be handled with caution, and be cut under Water.

Official Preparations.—Oleum Phosphoratum and Pilula Phosphori. Used in the preparation of Acidum Phosphoricum Concentratum and Calcii Hypophosphis.

Not Official.—Elixir Phosphori, Elixir Phosphori Compositum, Pilula Phosphori cum Sevo, Pilulæ Phosphori Compositae, Pilulæ Phosphori cum Quinina, Sevum Phosphoratum, Spiritus Phosphori, and Tinctura Phosphori Composita.

Antidotes.—Stomach-tube, emetics. Copper Sulphate is both emetic and antidote: 3 grains dissolved in Water every 5 minutes till vomiting is induced, then continue it in 1 grain doses every quarter of an hour, with 10 drops of Solution of Morphine if rejected; also 30 drops of old or French Oil of Turpentine every half-hour. Half an oz. of Epsom Salts as a purgative. Demulcent drinks, but avoid oils and fats.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Mex. (Fosforo), Norw., Port., Russ., Span., Swed., Swiss and U.S. Not in Hung.

Tests.—Phosphorus melts under Water at 44° to 45° C. (111·2° to 113° F.); the *B.P.* states that it melts at 43·3° C. (110° F.). The

U.S.P., *Fr. Codex* and *P.G.* state 44° C. (111·2° F.). Its sp. gr. is given in the *B.P.* as 1·77, presumably at 15·5° C. (60° F.), the *U.S.P.* as 1·830 at 10° C. (50° F.) and 1·820 at 25° C. (77° F.), and the *Fr. Codex* as 1·83. When warmed in the air to a temperature a little over its m.p., it takes fire and burns, producing dense white fumes which, when dissolved in Water, afford a solution possessing an acid reaction, which yields with Ammonium Molybdate Solution and Nitric Acid a lemon-yellow precipitate soluble in Ammonia Solution, and reprecipitated as a white crystalline precipitate on the addition of Magnesium Ammonio-sulphate Solution. When oxidised with Nitric Acid it produces a solution yielding a similar precipitate to the above with similar reagents. When dissolved in Carbon Bisulphide and poured on to a strip of filter paper, the latter, on the evaporation of the solvent, is instantly ignited. It is required by the *U.S.P.* to contain not less than 99·5 p.c. of pure Phosphorus, but no method by which this percentage may be ensured is given.

The two chief impurities are Arsenic and Sulphur, which are tested for after the oxidation of the Phosphorus by means of Nitric Acid. The *B.P.* effects the oxidation by boiling 1 or 2 grammes of Phosphorus with 5 or 10 c.c. of Nitric Acid, mixed with an equal volume of Water. The *U.S.P.* employs 1 gramme of Phosphorus, and digests it at a gentle heat on a water-bath with a mixture of 10 c.c. of Nitric Acid and 10 c.c. of Water, a current of Carbonic Acid gas being passed over the surface of the liquid whilst solution is being effected. The *B.P.* requires that the resulting solution should yield no characteristic reaction with the tests for Arsenic, and only the slightest reactions with the tests for Sulphates. The *U.S.P.* requirements are a good deal more definite; the solution, after the oxidation of the Phosphorus, is evaporated until no further nitrous vapours are evolved, and diluted with Water to 100 c.c., 1 c.c. of which solution should not respond to the modified Gutzeit's test for Arsenic, the presence of the latter much in excess of 1 in 100,000, is manifested by the formation of a distinct yellow-orange spot. The addition of Barium Chloride T.S. to the remainder of the liquid is required to afford not more than a slight opalescence. Phosphorus should dissolve readily and completely in Carbon Bisulphide Solution to form a clear solution, but the greatest caution is necessary in handling such solution, as the dissipation of the solvent is followed by immediate ignition.

Preparations.

OLEUM PHOSPHORATUM.—PHOSPHORATED OIL.

1 of dry Phosphorus dissolved in 99 (by weight) of Almond Oil at 180° F. (82·2° C.). The Oil must first have been heated to 300° F. (149° C.) for 15 minutes, cooled and filtered. (about 1 in 100)

Dose.—1 to 5 minims = 0·06 to 0·3 c.c.

Foreign Pharmacopœias.—Official in Austr., 1 in 1000 Almond Oil; Belg. and Span., 1 in 100 Almond Oil; Ital., 1 in 100 Olive Oil; Fr. and Swed., 1 in 100 Almond Oil and Ether; Mex. (Aceite fosforado), 1 in 100 Sesame Oil;

Swiss, Phosphorus 1, Almond Oil 96, Alcohol (99 p.c.) 3, Natrum Sulfuricum Siccum 5. Not in the others.

PILULA PHOSPHORI.—Phosphorus Pill.

Dissolve 10 grains of Phosphorus in about 33 minims of Carbon Bisulphide, and add it to a mixture of 125 grains of melted White Beeswax and 125 grains of Lard cooled to a cream-like consistence; mix thoroughly, adding also 115 grains of Kaolin.

The pill mass should be kept under Water in a light-proof stoppered bottle and, when required, it should be made into pills with one-third of its weight of powdered Gum Acacia and varnished.

The finished pill is now 1 in 50, which is twice the strength of *B.P.* 1885.

Dose.—1 to 2 grains = 0·06 to 0·13 gramme.

Foreign Pharmacopœias.—Official in U.S., about $\frac{1}{100}$ grain of Phosphorus in each pill. Not in the others.

Not Official.

ELIXIR PHOSPHORI.—Compound Tincture of Phosphorus 1; Glycerin 4; should be preserved from the light. Each fl. drm. contains $\frac{1}{50}$ grain = 0·0013 gramme of Phosphorus.—*B.P.C. Formulary* 1901.

Dose.—15 to 60 minims = 0·9 to 3·6 c.c.

This has been incorporated in the *B.P.C.* with the *synonym* **Syrupus Phosphori;** Syrup of Phosphorus.

It should be freshly prepared as required.

ELIXIR PHOSPHORI.—Spirit of Phosphorus (*N.F.*), 21; Oil of Anise, 0·2; Glycerin, 56; Aromatic Elixir (*U.S.P.*), *q.s.* to make 100.—*U.S.N.F.*

Elixir Phosphori Compositum. *Syn.* Syrupus Phosphori Composita.—Compound Tincture of Phosphorus, 20; Oil of Anise, 0·20; Glycerin, 50; Aromatic Elixir, *q.s.* to produce 100.—*B.P.C.*

Spiritus Phosphori. *Syn.* Tincture of Phosphorus.—Phosphorus, 1·2; Absolute Alcohol (*U.S.P.*), *q.s.* to make 1000.—*U.S.N.F.*

PILULA PHOSPHORI CUM SEVO.—(1) Phosphorus, 10 grains; Mutton Suet, 90 grains; Purified Carbon Bisulphide, 40 minims. Dissolve the Phosphorus in the Carbon Bisulphide, and incorporate with the Suet, previously rubbed into a smooth paste. (2) Starch, 60 grains; Powdered Liquorice Root, 60 grains; Powdered Soap, 40 grains; Powdered Tragacanth, 12 grains; Glycerin, 48 minims. Make into a pill mass.

No. 1 should be kept in a stoppered bottle, and incorporated with No. 2 as required for dispensing. 1 part of No. 1 with 8 parts of No. 2.

They should be freshly prepared as required.

Each 3-grain pill will contain $\frac{1}{30}$ grain of Phosphorus.

PILULÆ PHOSPHORI COMPOSITÆ.—Phosphorated Suet, 5; Quinine Sulphate, 12·50; Reduced Iron, 75; Strychnine, 0·50; Chloroform, 10; Compound Powder of Tragacanth, 5; Mucilage of Acacia, *q.s.* in 100 parts.—*B.P.C.*

This formula closely resembles that previously published in *Martindale*, except that 2 of these pills represent 1 of Martindale's.

PILULÆ PHOSPHORI CUM QUININA.—Phosphorated Suet, 10; Quinine Sulphate, 50; Chloroform, 20; Compound Powder of Tragacanth, 10; Mucilage of Acacia, *q.s.* in 100 parts.—*B.P.C.*

This formula closely resembles that previously published in *Martindale.*

SEVUM PHOSPHORATUM (10 p.c.).—Phosphorus, 1; Pure Carbon Bisulphide, 5; Dissolve, and add Prepared Suet, 9. Add a little of the Suet at first, mix quickly; add the remainder, mix thoroughly, and allow the Bisulphide to evaporate.—*Martindale.*

This has been incorporated in the *B.P.C.*

TINCTURA PHOSPHORI COMPOSITA.—Dissolve 12 grains Phosphorus in 2½ fl. oz. Chloroform by the aid of a gentle heat; add the solution to

12½ fl. oz. Ethylic Alcohol and shake well. Should be preserved in well-stoppered bottles and kept from the light.

10 minims contain $\frac{1}{60}$ grain of Phosphorus.

Dose.—3 to 12 minims = 0·18 to 0·71 c.c.

B.P.C. Formulary 1901, incorporated in the *B.P.C.* with a slight increase in strength, as follows:—

Phosphorus, 0·20; Chloroform, 17; Absolute Alcohol, *q.s.* to produce 100.

PHYSOSTIGMATIS SEMINA.

CALABAR BEAN.

FR., FÈVE DU CALABAR; GER., KALABARBOHNE; ITAL., FAVA DEL CALABAR; SPAN., HABA DEL CALABAR.

The ripe Seeds of *Physostigma venenosum*, Balfour.

The Seeds official in the *B.P.* are not required to yield any definite percentage of alkaloids. The *U.S.P.* Seeds are required to yield not less than 0·15 p.c. of Ether-soluble alkaloids. The Seeds are not official in the *P.G.*

Indigenous to Western Africa.

The chief constituent is a poisonous crystalline alkaloid, **Physostigmine** or **Eserine.**

Medicinal Properties.—Myotic, antispasmodic. It increases the flow of saliva and most of the other secretions. Used in tetanus; but its principal use is in ophthalmic work. *See* 'Physostigminæ Sulphas.'

Official Preparation.—Extractum Physostigmatis. Used to prepare Physostigminæ Sulphas.

Not Official.—Tinctura Physostigmatis.

Foreign Pharmacopœias.—Official in Belg. (Semen Calabariense); Jap. (Semen Physostigmatis); Mex. (Haba de Calabar); Port. (Favo do Calabar); Span. (Haba del Calabar); Swed. (Semina Calabar); U.S. (Physostigma). Not in the others.

Descriptive Notes.—Calabar Beans as recently imported are rather smaller and browner in colour than formerly. Formerly the seeds were almost black in colour and about 1⅜ in. (34 mm.) long, ¾ in. (19 mm.) broad, and ½ to ⅝ in. (12·5 to 15 mm.) in thickness, but the dimensions given in the official description are 'usually about 1 in. long (25 mm.), ¾ in. (18 mm.) broad, and ½ in. (12 mm.) thick.' The hilum extends nearly the whole length of the curved margin of the seed, which is elongate reniform in outline. The seed coat is hard, dark reddish-brown, and slightly rough. The two starchy cotyledons have a cavity between them. The seed has neither taste nor odour. At one time a seed of a different species, nearly cylindrical and scarcely curved, but about the same size, was offered in London as Calabar Bean. It has been referred to *Physostigma cylindrospermum*, Holmes. Other seeds quite different in shape and size from Calabar Bean have been offered as substitutes in the drug market, but none of these could be mistaken for the genuine drug.

Tests.—Calabar Bean is assayed in the *U.S.P.* by the following process:—A weighed quantity of 20 grammes is introduced into an Erlenmeyer flask of about 250 c.c. capacity and shaken well during 10 minutes with 200 c.c. of Ether, 10 c.c. of a 1 in 20 aqueous Sodium Bicarbonate Solution is added and the mixture shaken vigorously during 4 hours. A measured quantity of 100 c.c. (= 10 grammes of Calabar Bean) of the Ether solution is decanted into a separator after the powder has been allowed to settle. Sufficient Normal Volumetric Sulphuric Acid Solution and is added to render the liquid acid, and 10 c.c. of Water. The extraction is repeated first with a mixture of 2 c.c. of Normal Volumetric Sulphuric Acid Solution and 8 c.c. of Distilled Water, and then with a mixture of 1 c.c. of Normal Volumetric Sulphuric Acid Solution and 9 c.c. of Water. The acid liquids are in each case separated and transferred to another separator. Sufficient of a 1 in 20 aqueous Sodium Bicarbonate Solution is added to the combined acid liquids in the separator to render them alkaline to red Litmus paper, and the liberated alkaloids are extracted by shaking with 3 successive quantities each of 25 c.c., 20 c.c., and 15 c.c. of Ether, the ethereal solutions being separated in each instance, mixed, transferred to a flask, and carefully evaporated on a water-bath. The residue when dry is dissolved in 5 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution, 20 c.c. of absolutely neutral Ether added, and the mixture transferred to a stoppered bottle, rinsing the flask with 80 c.c. of Water. The excess of Tenth-normal Volumetric Acid Solution is titrated with Fiftieth-normal Volumetric Potassium Hydroxide Solution, 5 drops of Iodeosin T.S. being used as an indicator of neutrality. The number of c.c. of Fiftieth-normal volumetric alkali solution required divided by 5, the quotient subtracted from 5, the difference multiplied first by 0·0273 and then by 10, gives the percentage of Ether-soluble alkaloids contained in the Calabar Beans.

Preparation.

EXTRACTUM PHYSOSTIGMATIS.—EXTRACT OF CALABAR BEAN. 16 of Calabar Bean treated with 80 of Alcohol (90 p.c.); the liquid evaporated to a soft extract and mixed with 3 times its weight of Milk Sugar to form a firm extract.

It is about one-fourth the strength of *B.P.* 1885, and of the Foreign Pharmacopœias.

Dose.—$\frac{1}{4}$ to 1 grain = 0·016 to 0·032 gramme.

As it does not form a clear solution with Water, such solution should be filtered.

Foreign Pharmacopœias.—Official in Jap., Port. and U.S. Not in the others.

28 lb. of Calabar Beans, treated with Alcohol (90 p.c.), yielded 2·07 p.c. of extract; this extract yielded 5·74 p.c. of alkaloids, which is equal to nearly 0·12 p.c. of alkaloids in the Beans.

The same powder treated with boiling Alcohol (90 p.c.) in an exhaustion apparatus yielded 4·66 p.c. of extract; which extract yielded 3·2 p.c. of alkaloids, which is equal to nearly 0·15 p.c. of alkaloids in the Beans.

The extract of Calabar Bean official in the *B.P.* is not a standardised preparation. The *U.S.P.* extract is required to contain 2 p.c. of Ether-soluble alkaloids; the extract is not official in the *P.G.*

Tests.—The *U.S.P.* employs a process for the assay of the extract of which the following contains the essential features:—A weighed quantity of 1 gramme of the extract is transferred to a small porcelain evaporating basin and digested for 5 minutes at a temperature below the boiling point of boiling Water with 5 c.c. of Alcohol (48·9 p.c.). After the addition of 5 grammes of very clean fine sand the mixture is evaporated to dryness on a water-bath and triturated thoroughly to ensure a uniform mixture, the contents of the dish are transferred as soon as dry to an Erlenmeyer flask (using a little more clean sand to transfer the residue to the flask) and shaken with 100 c.c. of Ether, a measured quantity of 10 c.c. of a 1 in 20 aqueous Sodium Bicarbonate Solution is added and the contents vigorously shaken at intervals for 1 hour. When the powder has settled, 50 c.c. of the Ether solution is decanted into a separator, and sufficient Normal Volumetric Sulphuric Acid Solution to render the liquid acid in reaction towards blue Litmus paper, and 10 c.c. of Distilled Water are added and the liquid shaken, the shaking being repeated with 2 successive quantities each of 2 c.c. of Normal Volumetric Sulphuric Acid solution and 8 c.c. of Distilled Water, and 1 c.c. of Normal Volumetric Sulphuric Acid Solution and 9 c.c. of Distilled Water, the acid liquids being in each case separated and transferred to a second separator. Sufficient of a 1 in 20 aqueous Sodium Bicarbonate Solution is added to the mixed acid liquids to render them alkaline in reaction towards red Litmus paper, and the liberated alkaloids are extracted by agitation with 3 successive quantities each of 25 c.c., 20 c.c., and 15 c.c. of Ether; the ethereal solution being in each instance separated and transferred to a flask. They are mixed, evaporated on a water-bath, and when dry the residue is dissolved in 2 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution, and when dissolved is transferred to a 200 c.c. flask, washing the flask with Water and adding enough Water to bring the volume to about 90 c.c. 25 c.c. of Ether is added and the excess of Tenth-normal Volumetric Acid Solution is titrated with Fiftieth-normal Volumetric Potassium Hydroxide Solution, using 5 drops of Iodeosin T.S. as an indicator of neutrality. The number of c.c. of Fiftieth-normal Volumetric Potassium Hydroxide Solution required divided by 5, the quotient subtracted from 2, and the difference multiplied first by 0·0273 and then by 200, yields the percentage of Ether-soluble alkaloids present in the sample operated on.

Not Official.

TINCTURA PHYSOSTIGMATIS.—Calabar Bean, 1; Alcohol (90 p.c.), 5.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.
B.P.C. Formulary 1901, is incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in U.S., 1 in 10. Not in the others. The *U.S.P.* tincture is required to contain 0·014 p.c. w/v of Ether-soluble alkaloids. Neither the *B.P.* nor the *P.G.* includes a Tincture of Physostigmine.

Tests.—A measured quantity of 100 c.c. of the tincture is evaporated to dryness on a water-bath, and the proportion of Ether-soluble alkaloids from Physostigmine in the extract so obtained is determined by the *U.S.P.* process given under Extractum Physostigmatis; and when calculating the result of the volumetric determination into terms of Ether-soluble alkaloids the product should be multiplied by 2 instead of 200, that is to say, the number of c.c. of Fiftieth-normal Volumetric Potassium Hydroxide Solution required to neutralise the excess of Tenth-normal Volumetric Acid Solution divided by 5, the quotient subtracted from 2, the difference multiplied first by 0·0273 and then by 2, yields the percentage w/v of Ether-soluble alkaloids in the sample operated on.

PHYSOSTIGMINÆ SULPHAS.

PHYSOSTIGMINE SULPHATE.

B.P.Syn.—ESERINE SULPHATE.

$(C_{15}H_{21}N_3O_2)_2, H_2SO_4$, eq. 643·80.

FR., SULFATE D'ESERINE; GER., PHYSOSTIGMINSULFAT; ITAL., ESERINA SOLFATO; SPAN., SULFATO DE ESERINA.

A whitish or yellowish-white, very deliquescent micro-crystalline powder, possessing a bitter taste. It should be carefully preserved in small, well-stoppered glass bottles of a dark amber tint, or in sealed tubes protected from the light.

It is the Sulphate of an alkaloid obtained from Calabar Bean. The Sulphate alone is official in the *B.P.* The *P.G.* and the *U.S.P.* include both the Sulphate and the Salicylate. The *Fr. Codex* only includes the Salicylate. The Pharmacopœia formula for the Sulphate is given as $x H_2O$. The *U.S.P.* gives the formula for the anhydrous salt. *P.G.* does not include formulas.

Solubility.—4 in 1 of Water; $2\frac{1}{2}$ in 1 of Alcohol (90 p.c.).

Medicinal Properties.—It is used to contract the pupil in ciliary paralysis due, *e.g.*, to diphtheria; to reduce intra-ocular tension in glaucoma, etc.; to prevent or reduce prolapse of the iris after corneal wounds; to diminish the amount of light in painful affections of the eye; to break down adhesions due to iritis, its use being alternated with that of Atropine; and to remove the prolonged dilatation and paralysis produced by the latter. In tetanus it is to be given fearlessly, $\frac{1}{30}$ grain hypodermically frequently repeated, the patient being carefully watched. An antidote in Strychnine poisoning.

Dose.—$\frac{1}{60}$ to $\frac{1}{20}$ grain = 0·0011 to 0·0032 gramme.

Dutch maximum single dose, 0·001 gramme; maximum daily dose, 0·003 gramme.

Prescribing Notes.—*The salts of Physostigmine as well as the solutions are liable to become pink by oxidation. They should be kept in yellow non-actinic glass bottles, and as much as possible preserved from the air.*

If desirable the coloration of the solutions may be prevented by the addition of a trace of Hypophosphorous Acid or Sulphurous Acid.

Official Preparation.—Lamellæ Physostigminæ.

Not Official.—Guttæ Physostigminæ, Guttæ Physostigminæ cum Cocaina, Physostigmina, Unguentum Physostigminæ, Physostigminæ Hydrobromidum, and Physostigminæ Salicylas.

Foreign Pharmacopœias.—Official in Dutch, Ger., Jap., Mex. (Sulfato de Eserina), Span., and U.S. Not in the others.

Tests.—Physostigmine Sulphate is stated by the *U.S.P.* to soften at 130° C. (266° F.), and to melt at 140° C. (284° F.); neither the *B.P.* nor the *P.G.* makes any reference to the m.p. It dissolves readily in Water, yielding a solution which is neutral in reaction towards Litmus paper. The *U.S.P.* states that it possesses an acid reaction towards blue Litmus paper. The addition of Potassium or Sodium Hydroxide Solution causes a white precipitate of the alkaloid which quickly turns pink, and the precipitate itself dissolves in an excess of the Hydroxide Solution, with the production of a pinkish or red coloured solution; when evaporated to dryness with Ammonia Solution a bluish coloured residue remains, and if this residue be dissolved in very dilute acid the solution assumes a red coloration by reflected light, and a blue coloration by transmitted light. A trace of the salt dissolved in Fuming Nitric Acid yields a yellow solution, which, when evaporated to dryness on a water-bath, yields a residue of a green colour. The *U.S.P.* states that 5 mg. of the salt yield a yellow coloured solution when dissolved in Nitric Acid, on heating this solution the colour changes from orange to blood-red, and leaves on evaporation to dryness a green-coloured residue. The residue on exposure to the fumes of Nitric Acid yields a violet-blue colour, and on the addition of a drop of Nitric Acid a reddish-violet coloured solution changing rapidly to blood-red, and on standing, or on dilution, a greenish-yellow. The most distinctive test for Eserine is the marked mydriasis which it produces on the pupil of the eye; a highly diluted aqueous solution applied to the conjunctiva causes almost immediate contraction of the pupil. Sulphuric Acid yields only a faint yellow colour with the salt. Sulphuric Acid containing a crystal of Potassium Iodate yields a pale purple coloration rapidly changing to yellowish-red. The aqueous solution, with or without acidification with Hydrochloric Acid, yields with Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid. The Sulphate may be distinguished from the Salicylate by yielding when dissolved in Water a yellowish-white precipitate with Platinic Chloride Solution, and by the non-production of a violet colour on the addition of Ferric Chloide T.S. When ignited with free access of air it should leave no weighable residue.

Preparation.

LAMELLÆ PHYSOSTIGMINÆ. DISCS OF PHYSOSTIGMINE. Gelatin discs, containing $\frac{1}{1000}$ grain of Physostigmine Sulphate.

Now made with Physostigmine Sulphate instead of Physostigmine.

Foreign Pharmacopœias.—Official in Ital., Dischi Oftalmici con Eserina, each disc containing about 0·0001 gramme Eserine Salicylate. Not in the others.

Hypodermic lamels containing $\frac{1}{100}$ grain.—*Bartholomew's.*

Not Official.

GUTTÆ PHYSOSTIGMINÆ.—Physostigmine Sulphate, ½, 1, 2, or 4 grains; Water, 1 fl. oz.—*London Ophthalmic.*

GUTTÆ PHYSOSTIGMINÆ CUM COCAINA.—Physostigmine

Sulphate, 1 grain; Cocaine Hydrochloride, 4 grains; Water, 1 fl. oz.—*London Ophthalmic.*

PHYSOSTIGMINA. Eserine. $C_{15}H_{21}N_3O_2$, eq. 273·23.—Colourless or pale pink glistening crystals, very slightly soluble in Water, readily soluble in Alcohol (90 p.c.), Ether and Chloroform. It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from contact with the air and light.

It was official in *B.P.* '85, but deleted from *B.P.* '98, the Sulphate being made official.

Unguentum Physostigminæ (Unguentum Eserinæ). Physostigmine, 1 grain; Soft Paraffin, 1 oz., is given in *London Ophthalmic.*

Tests.—Physostigmine melts at 102° to 103° C. (215·6° to 217·4° F.). Petit and Polonovski give 105° to 106° C. (221° to 222·8° F.). It dissolves very slightly in Water; it is readily soluble in Alcohol and Ether, the solutions in these solvents being strongly lævogyrate. The aqueous solution is alkaline in reaction towards red Litmus paper, and precipitates Ferric Hydroxide from Ferric Chloride Solution, provided the latter is not too acid; it answers the tests characteristic of Eserine given under Physostigminæ Sulphas.

PHYSOSTIGMINÆ HYDROBROMIDUM.—In colourless crystals, very soluble in Water.

PHYSOSTIGMINÆ SALICYLAS. *Syn.* ESERINÆ SALICYLAS. $C_{15}H_{21}N_3O_2C_7H_6O_3$, eq. 410·24.—Colourless or faintly yellowish acicular crystals, becoming coloured on exposure to light and air. Soluble 1 in 130 of Water; 1 in 15 of Alcohol (90 p.c.). The Salicylate of the *Fr. Codex* contains 66·59 p.c. of Eserine and 33·41 p.c. of Salicylic Acid.

It is the Salicylate of Physostigmine, an alkaloid obtained from Calabar Bean. It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from contact with the light and air, as it rapidly acquires a reddish tint on exposure to their combined influence.

A sterilised solution containing 0·2 gramme of Eserine Salicylate in 40 grammes of Olive Oil is stated (*P.J.* '05, i. 589) to keep indefinitely and to produce immediate and painless action upon the eye.

The theory that the formation of Rubeserine is due to the absorption of atmospheric Ammonia by the solution is stated (*C.D.* '05, ii. 515) to be inadmissible. Conjunctivitis has occasionally been traced to the use of oxidised solutions of Eserine. A reference is again made to the use of oily solutions of the alkaloid or of the Salicylate.

Ph. Ger. maximum single dose, 0·001 gramme; maximum daily dose, 0·003 gramme.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Fr., Ger., Hung., Ital., Jap., Mex., Norw., Russ., Swed., Swiss and U.S. Not in the others.

Tests.—Physostigmine Salicylate melts at about 179° C. (354·2° F.). The *U.S.P.* states that it softens and assumes a slightly yellow colour at 160° C. (320° F.) and melts at 178·9° C. (354° F.). *Fr. Codex* gives 182° C. (359·6° F.). It dissolves in Water, forming a clear solution, which is faintly acid in reaction towards blue Litmus paper. It should answer the tests characteristic of Physostigmine given under Physostigminæ Sulphas. Sulphuric Acid, containing a drop of Formaldehyde Solution in each c.c., produces a bright pink colour. Sulphuric Acid, with a few crystals of Cane Sugar, produces a yellow colour changing to brownish-purple and ultimately to greenish-black. An aqueous solution of the salt affords with Ferric Chloride T.S. a deep violet coloration. The addition of Bromine Water, if present in excess, produces an intense red coloration in the salt or its solution. It may be distinguished from the Sulphate by not yielding a precipitate on the addition of Platinic Chloride Solution, and by the production of a violet coloration with Ferric Chloride T.S. It should leave no weighable residue when ignited with free access of air.

Not Official.

PHYTOLACCA.

Both the **Fruit** (Poke fruit) and the **Root** (Poke root) of *Phytolacca decandra*, L., are official in U.S. The Root is official in Jap.

The Fluid Extract has been recommended for inflamed and painful mammæ, internally and as a local application.—*B.M.J.* '87, ii. 844. It has also been used in orchitis.—*T.G.* '85, 622. In large doses it is emetic, purgative, and slightly narcotic.

FLUIDEXTRACTUM PHYTOLACCÆ RADICIS (*U.S.*).—1 fl. oz. is equal to 1 oz. of root.

Dose.—As an alterative, 1 to 5 minims = 0·06 to 0·03 c.c.

Official in Jap.

TINCTURA PHYTOLACCÆ.—Poke Root, 1; Alcohol (45 p.c.), 10. Dose.—3 to 10 minims = 0·18 to 0·6 c.c.—*Martindale.*

This has been incorporated in the *B.P.C.*

PHYTOLACCIN.—An eclectic remedy used in rheumatic and syphilitic conditions. In pill as a cholagogue and alterative, $\frac{1}{4}$ to $\frac{1}{2}$ grain = 0·016 to 0·032 gramme; purgative, 2 to 4 grains = 0·13 to 0·26 gramme.

Not Official.

PICRORHIZA.

The dried Rhizome of *Picrorhiza Kurroa*, Royle, dose in powder, as a tonic, 10 to 20 grains = 0·65 to 1·3 grammes; as an antiperiodic, 40 to 50 grains = 2·6 to 3·2 grammes, is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies; also **Extractum Picrorhizæ Liquidum,** 1 in 1 Fluid Extract made with Alcohol (60 p.c.), dose, 20 to 60 minims = 1·2 to 3·6 c.c.; and **Tinctura Picrorhizæ,** Picrorhiza 1, Alcohol (45 p.c.) 8, by maceration, dose, $\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c.

PICROTOXINUM.

PICROTOXIN.

Colourless, shining, prismatic crystals, or micro-crystalline powder permanent in the air, possessing an intensely bitter taste. It is the neutral principle obtained from 'Cocculus Indicus' described in *B.P.* as the Fruits of *Anamirta paniculata*, Colebr.

Picrotoxin is stated to be not a simple body but a compound, containing 34 p.c. of Picrotin and 66 p.c. of Picrotoxinin, but its composition cannot be considered as definitely settled.

Solubility.—1 in 334 of Water; 1 in $13\frac{1}{2}$ of Alcohol (90 p.c.).

Medicinal Properties.—Anhidrotic; $\frac{1}{60}$ grain at bedtime has been given as a remedy against immoderate sweating in phthisis.

Externally used with caution as an **ointment** (8 grains to 1 oz.) for pediculi.

Dose.—$\frac{1}{100}$ to $\frac{1}{25}$ grain = 0·0006 to 0·0024 gramme.

Antidotes.—Stomach-tube, or emetic; Chloral, and Potassium Bromide.

Foreign Pharmacopœias.—Official in Fr. and Mex. Not in the others.

Tests.—Pure Picrotoxin melts at 199° to 200° C. (390·2° to 392° F.), the *B.P.* melting at 192·2° C. (378° F.), the *Fr. Codex* at 200° C. (392° F.). It is officially stated to be soluble in 10 parts of

Potassium Hydroxide Solution, the liquid so formed producing a red precipitate with Potassio-cupric Tartrate (Fehling's solution). The test may also be applied to a cold saturated aqueous solution, 5 c.c. of which will give a distinct reaction; if a similar quantity of Pavy's solution be added and the liquid boiled the blue colour will completely disappear. It dissolves in Sulphuric Acid with the production of a bright yellow coloured solution, changing to orange-red on warming, and very gradually to reddish-brown. It dissolves in Nitric Acid, and the liquid on evaporation leaves a reddish-yellow residue, becoming bright red when moistened with Potassium Hydroxide Solution. It may be distinguished from alkaloids by not yielding when dissolved in Water precipitates with Platinic Chloride, Potassio-mercuric Iodide, Mercuric Chloride, Tannic Acid, Potassium Ferrocyanide and Ferricyanide Solutions, and most of the general reagents for alkaloids. When ignited with free access of air it should leave no weighable residue.

PILOCARPINÆ NITRAS.

PILOCARPINE NITRATE.

$C_{11}H_{16}N_2O_2$, HNO_3, eq. 269·23.

FR., AZOTATE DE PILOCARPINE; GER., PILOCARPINITRAT;
ITAL., PILOCARPINA NITRATO.

It is the Nitrate of Pilocarpine, an alkaloid obtained from Jaborandi Leaves. A synthetic Pilocarpine has also been produced.

Pilocarpine Nitrate occurs as white distinct crystals. Jowett states that the Nitrate is the most convenient to use in medicine, on account of its stability in the air, the Hydrochloride being hygroscopic in moist air. It should be kept in well-stoppered glass bottles of a dark amber tint and in a cool atmosphere.

Solubility.—1 in 8 of Water; 1 in 50 of Alcohol (90 p.c.); almost insoluble in Ether and in Chloroform.

Medicinal Properties.—A powerful diaphoretic and sialagogue. Is useful in the dropsy and thirst of Bright's disease, in uræmia, and to remove pleural and peritoneal effusion. It should be used with caution, if at all, in cardiac dropsy. It contracts the pupil, and has been used in detachment of the retina, glaucoma and intra-ocular hæmorrhage; it has been given in bronchitis and asthma; and in chronic poisoning by lead, arsenic or mercury. Useful in deafness due to disease of the auditory nerve. A good antidote in Belladonna poisoning.

It has been used to increase the growth of the hair as a **Lotion** containing 1 or 2 grains to 1 fl. oz., and as an Ointment containing 4 to 8 grains to 1 fl. oz.

In pneumonia, $\frac{1}{10}$ to $\frac{1}{3}$ grain hypodermically.—*L.* '03, i. 1369; '03, ii. 342; *B.M.J.* '03, ii. 788. $\frac{1}{6}$ to $\frac{1}{4}$ grain by the mouth.—*L.* '03, i. 823.

In detachment of the retina, 1 cg. of the Nitrate injected in a 2 p.c. solution, —*B.M.J.E.* '99, ii. 68.

$\frac{1}{6}$ grain injected subcutaneously in severe uræmia of Bright's disease.—*Pr.* lxvii. 657.

Objection taken to the *B.P.* dose, $\frac{1}{20}$ to $\frac{1}{2}$ grain, when given by the mouth as being too high. In one case $\frac{1}{40}$ grain caused vomiting every time it was taken; in another $\frac{1}{80}$ grain caused profuse sweating and exhaustion lasting some hours. Probably $\frac{1}{20}$ grain is the highest initial dose that should be given.—*B.M.J.* '02, ii. 1104.

Its use in puerperal eclampsia has been abandoned at the Rotunda Hospital, Dublin.—*L.* '05, ii. 749.

Of great value in all forms of pruritus, but especially that of the vulva; $\frac{1}{8}$ to $\frac{1}{4}$ grain by mouth only when itching manifests itself; the addition of $\frac{1}{120}$ grain Atropine may sometimes be necessary to prevent sweating.—*M.R.* '07, i. 858.

While the most powerful of the internal diaphoretics, it must be used cautiously owing to its tendency to depress the heart.—*B.M.J.* '06, ii. 1450.

Dose.—$\frac{1}{20}$ to $\frac{1}{2}$ grain = 0·0032 to 0·032 gramme.

Prescribing Notes.—*Most frequently used by hypodermic injection; also given in solution, and in pills with Milk Sugar, and Glucose.*

Supplied also in hypodermic tablets, $\frac{1}{10}$, $\frac{1}{8}$, $\frac{1}{6}$, $\frac{1}{4}$ *and* $\frac{1}{3}$ *grain.*

The nearly equal solubility of the Pilocarpine Nitrate and Pilocarpidine Nitrate allows them to crystallise together. With the Hydrochlorides the difference in solubility is much more marked, so that a Pilocarpine Hydrochloride can be obtained containing very little Pilocarpidine.

The **Pilocarpine Hydrochloride** is preferred in all other countries, *see* below, and in London is more frequently prescribed than the Nitrate; but it is incompatible with Silver salts, with which Pilocarpine is sometimes used.

Not Official.—Guttæ Pilocarpinæ, Injectio Pilocarpinæ Nitratis, Pilocarpine, Pilocarpinæ Hydrochloridum, Pilocarpinæ Phenas, and Pilocarpinæ Salicylas.

Foreign Pharmacopœias.—Official in Fr., Mex. and U.S. Not in the others. Fr. and Mex. have Pilocarpine.

Antidote.—Belladonna by the mouth, or Atropine hypodermically.

Tests.—Pilocarpine Nitrate is required by the *B.P.* to form with strong Sulphuric Acid a yellowish solution, which on the addition of Potassium Bichromate gradually assumes an emerald-green colour; the *U.S.P.* states that with Sulphuric Acid a colourless solution is produced. A characteristic reaction is the mydriasis produced by a dilute aqueous solution of the salt. The *B.P.* does not include a m.p.; the *U.S.P.* states that it melts at 170·9° C. (339·7° F.). Pure Pilocarpine Nitrate, according to Jowett, melts at 173° to 178° C. (343·4° to 352·4° F.); according to Petit and Polonovski at 177° to 178° C. (350·6° to 352·4° F.).; the *Fr. Codex* (1908) gives 177° C. (350·6° F.). It has a specific rotation of +80° to +83°. *Fr. Codex* +82° 2′ at 18° C. The addition of an excess of Ammonia Solution to an aqueous solution of the salt should not afford a precipitate; the addition of Sodium Hydroxide Solution to dilute aqueous solutions of the salt affords no precipitate, but if the solutions be sufficiently concentrated, a white turbidity is produced. The separated alkaloid should answer the tests distinctive of Pilocarpine given under that heading. As an additional test Jowett has suggested the formation of a crystalline Picrate which should melt sharply at 147° C. (296·6° F.). When dissolved in Water it affords a clear colourless solution, which should possess a faint acid reaction towards blue Litmus paper, and which, when kept cool and mixed with an equal volume of Sulphuric Acid, affords a brown ring at the junction of the two liquids when a solution of Ferrous Sulphate is carefully poured on the surface of the mixture. Pilocarpine Nitrate may be distinguished from the Hydrochloride by rubbing the salt with an equal weight of Mercurous Chloride: in the case of the Nitrate no black coloration is produced; in the case of the Hydrochloride the Mercurous Chloride is reduced with the formation of metallic Mercury, a blackening in colour simultaneously occurring. According to the *U.S.P.* it may be distinguished from other alkaloids by dissolving 10 to 20 mg. of the salt in 2 c.c. of Water, and adding 2 c.c. of a slightly acidified Hydrogen Peroxide Solution, and pouring upon the surface of the liquid a layer of Benzene. On the addition of 3 or 4 drops of a 1 in 300 Potassium Bichromate Solution the Benzene layer will acquire a violet colour if the mixture be gently shaken, the aqueous layer remaining yellow. The *U.S.P.* states that if more than 20 mg. be taken the Benzene turns blue, and the reaction is no longer characteristic. The *B.P.* and the *U.S.P.* require that when ignited with free access of air it shall leave no residue.

Not Official.

GUTTÆ PILOCARPINÆ.—Pilocarpine Nitrate, 2 grains; Distilled Water, 1 fl. oz.—*London Ophthalmic.*

INJECTIO PILOCARPINÆ NITRATIS.—Pilocarpine Nitrate, 1; Water, 20. Dose, 2 to 6 minims.—*London Ophthalmic.*

Pilocarpine Nitrate, 1 grain; Distilled Water, 12 minims. Dose, 1 to 4 minims.—*Guy's.*

To prepare the patient for the injection, remove the nightshirt, wrap him closely in a warm blanket, and cover him with two more blankets. Put hot-water bottles to his feet, and give him hot drinks freely. After the sweating has ceased, remove the blankets gradually, dry the skin thoroughly, and leave him between warm dry blankets.—*Guy's.*

PILOCARPINE ($C_{11}H_{16}N_2O_2$, eq. 206·65).—It is the principal alkaloid contained in Jaborandi Leaves, and may also be produced synthetically. It forms a colourless and odourless thick syrup, which becomes thinner on warming. It is readily soluble in Water, Alcohol (90 p.c.), and Chloroform. The solutions are dextrogyrate. It gives no colour reaction with strong Sulphuric or Nitric Acid; with Sulphuric Acid and Potassium Bichromate it gives a dark green coloration. When triturated with an excess of Calomel the latter is reduced to metallic Mercury, a darkening in colour resulting. It is precipitated by the usual alkaloidal reagents, such as Potassio-mercuric Iodide (Mayer's) Solution, Iodo-potassium Iodide (Wagner's) Solution, Tannic Acid, etc. It is stated by Allen to give no reaction with Picric Acid, but Jowett (*Y.B.P.* '99, 436) states that the alkaloid affords a yellow precipitate which dissolves on warming, again separating out in needles when the solution cools. It may be determined by titration with Tenth-normal Volumetric Sulphuric or Hydrochloric Acid Solution, using Iodeosin Solution as an indicator of neutrality. 1 c.c. of Tenth-normal Volumetric Acid Solution is equivalent to 0·02066 gramme of pure Pilocarpine.

PILOCARPINÆ HYDROCHLORIDUM. Pilocarpine Hydrochloride. $C_{11}H_{16}N_2O_2$ HCl, eq. 242·84.—Colourless or white cubical crystals, deliquescent in moist air; soluble in less than its own weight of Water; 1 in 10 by weight of Ethyl Alcohol; almost insoluble in Ether or Chloroform.

A more definite salt than the Nitrate, being more easily separated from accompanying Hydrochlorides of the other bases, but deliquescent in moist air.

It should be kept in well-stoppered glass bottles of a dark amber tint and in a cool atmosphere; it should also be kept as far as possible from contact with a moist atmosphere.

Dose.—$\frac{1}{20}$ to $\frac{1}{2}$ grain = 0·0032 to 0·032 gramme.

Ph. Ger. maximum single dose, 0·02 gramme; maximum daily dose, 0·04 gramme.

Incompatibles.—Alkalis, and Alkaline Carbonates, Lead, Mercurous and Silver salts.

Foreign Pharmacopœias. Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw. (Chloretum Pilocarpicum), Russ., Swed., Swiss and U.S. Not in the others.

Tests.—Pure Pilocarpine Hydrochloride melts when anhydrous, according to Petit and Polonovski, at 200° C. (392° F.), and this m.p. is that officially adopted in the *Fr. Codex* (1908). The *U.S.P.* gives the m.p. of the salt after drying for several hours at 100° C. (212° F.) as 195·9° C. (384·5° F.). *P.G.* gives the m.p. as 193° to 195° C. (379·4° to 383° F.). Jowett states (*Y.B.P.* '99, 441) that when the salt dried at 100° C. (212° F.) is heated in a capillary tube it melts at 200° to 204° C. (392° to 399·2° F.). Solutions of the salt are dextrogyrate, the specific rotatory power of the aqueous solution being + 80° to + 92°. *Fr. Codex* gives + 91° at 18° C. for the 2 p.c. w/v aqueous solution. When dissolved in Water it forms a clear colourless solution which should have a neutral or at the most but faintly acid reaction towards Litmus paper. It should dissolve in Sulphuric Acid to form an almost colourless liquid, Hydrochloric Acid gas being simultaneously evolved. On the addition of a tiny crystal of Potassium Bichromate a bright emerald-green coloration is produced. Ammonia Solution should not produce a precipitate when added to a concentrated aqueous solution of the salt, and Sodium or Potassium Hydroxide Solution added to a similar solution should produce but a few oily drops, which quickly redissolve. The separated alkaloid should answer the tests characteristic of Pilocarpine given under that heading. The aqueous solution should yield when acidified with Nitric Acid, and on the addition of Silver Nitrate Solution, a white curdy precipitate insoluble in Nitric Acid, soluble in Ammonia Solution or in Potassium Cyanide Solution. It may be distinguished from the Nitrate by yielding a black coloration when rubbed with an equal quantity of Mercurous Chloride. Pilocarpine Nitrate under similar conditions yields no black coloration. It may be distinguished from other alkaloids by the Ammonia test given above or by dissolving 10 to 20 mg. of the salt in 2 c.c. of Water, mixing the solution with 2 c.c. of a slightly acidified Hydrogen Peroxide Solution, carefully adding sufficient Benzene to form a small layer on the surface of the liquid, and adding 3 or 4 drops of a 1 in 300 Potassium Bichromate Solution; on gently shaking the mixture the Benzene layer will acquire a violet colour, the aqueous layer remaining yellow.

The *U.S.P.* states that if more than 20 mg. be used the Benzene turns blue and the reaction is no longer characteristic.

When ignited with free access of air it should leave no residue.

It is official in 15 out of the 17 Foreign Pharmacopœias.

PILOCARPINÆ PHENAS.—A colourless, oily liquid, soluble in Water and in Alcohol, has been recommended in phthisis and intermittent fevers, 1 fl. drm. of a solution of 1 grain in 10 fl. oz. of $2\frac{3}{4}$ p.c. Carbolic Acid Solution (**Aseptoline**) injected into the abdominal wall.—*P.J.* '96, ii. 379; '98, i. 84.

PILOCARPINÆ SALICYLAS.—Colourless crystals, or as a white crystalline powder, soluble in Water, less soluble in Alcohol (90 p.c.). Employed for purposes similar to those of the Nitrate or Hydrochloride.

It should be kept in well-stoppered glass bottles of a dark amber tint.

Tests.—Pilocarpine Salicylate melts at about 120° C. (248° F.); it dissolves readily in Water, forming a solution which is faintly acid in reaction towards blue Litmus paper. It dissolves in concentrated Sulphuric Acid without change of colour, but in Fuming Nitric Acid it forms a yellowish-brown solution. The aqueous solution should yield a whitish amorphous precipitate with Potassio-mercuric Iodide (Mayer's) Solution, and with Iodo-potassium Iodide (Wagner's) reagent a brownish precipitate. The addition of Sodium Hydroxide Solution to a concentrated aqueous solution of the salt causes a whitish turbidity settling out into oily drops soon dissolving in an excess of the Hydroxide Solution. The addition of Ammonia Solution to the concentrated aqueous solution of the salt should cause no precipitate; when dissolved in Water it yields on the addition of Ferric Chloride T.S. a deep violet coloration; the Salicylic Acid separated from the salt should possess the m.p. and answer the tests characteristic of Salicylic Acid given under that heading. When ignited with free access of air it should leave no weighable residue.

PILULÆ.

PILLS.

Fr., Pilules; Ger., Pillen; Ital., Pillole; Span., Pildoras.

This class of medicine, so convenient and portable, was introduced in the earliest Pharmacopœias, and some of the formulas remain almost unchanged. The Pilula Rufi (Pilula Aloes et Myrrhæ) has for at least two hundred years maintained practically the same composition, but in *B.P.* '98 the Saffron is omitted.

Excipients for pills are of two kinds: (1) those which are more or less fluid, and employed to bind together powders, or to impart the necessary moisture to adhesive substances; (2) those, generally in powder, which are intended to absorb moisture and give solidity to the mass. Of the former, 'Dispensing Syrup' (equal volumes of Alcohol (90 p.c.), Glycerin, Syrup and Mucilage) and 'Diluted Glucose' (Glucose 3, Syrup 1), are most in request; Alcohol (60 p.c.) also is very useful. Glycerin by itself is distinctly inferior to the foregoing. Glycerin of Tragacanth is much employed, but in the majority of cases where it would be used Glucose or 'Diluted Glucose' is preferable. Of the powders, that of Liquorice root is most useful when moisture is to be absorbed and no binding power is required. An unexpected exception is the case of Carbolic Acid, which makes a very good plastic mass with twice its weight of Liquorice powder (when well worked together the result is very satisfactory). When more plasticity is required the absorbent powder is supplemented by Compound Tragacanth Powder or powdered Gum Acacia. For essential Oils this condition is best obtained by the use of powdered Curd Soap; as a rule, 1 minim of the Oil will require half a grain of the Soap and 2 grains of the Liquorice. A good powder to mix with small doses of powerful medicines is the '**Diluting Mixture**' (Sugar of Milk 3, and Compound Tragacanth Powder 1), which will make a good pill with 'Diluted Glucose' *q.s.* A mixture of Paraffins (Massa Paraffini), or with Kaolin (Massa Kaolini), is used for substances which are readily reduced by organic matter, such as the Permanganates and the salts of Gold and Silver. It 'goes without saying' that an excipient must not be chemically incompatible with the other ingredients, but there is not much opportunity for such an occurrence with those above selected.

Coatings.—Pills have been finished in various ways: rolled in Flour, Starch, Magnesia, Liquoric powder, and in Lycopodium, or a mixture of these; enveloped in Silver or Gold Leaf; coated with Ether-alcoholic solution of Tolu, or better with **Sandarach Varnish** (Ether 2, Absolute Alcohol 6, Sandarach 3), or with Gelatin or French Chalk. A good mucilage for applying the white coating to pills is: Powdered Tragacanth, 1; Powdered Gum Acacia, 4; Diluted Acetic Acid, 8; Distilled Water, 40; or it can be made with Chloroform Water in place of Distilled Water, omitting the Acetic Acid. Another protective coating is **Salol Varnish** (Salol 1, Sandarach Varnish 5). Pills containing substances exceedingly soluble in Alcohol should not be varnished, as the varnish may dissolve some part of the pill.

When pills are intended to pass through the stomach, and to be disintegrated in the intestine, they are coated with a solution of Keratine, *see* p. 710.

PIMENTA.

PIMENTO.

FR., PIMENT DE LA JAMAIQUE; GER., ENGLISCHES GEWÜRZ; ITAL., PIMENTI; SPAN., PIMIENTA DE LA JAMAICA.

The dried, full-grown, unripe Fruit of *Pimenta officinalis*, Lindley.

From the West Indies.

Medicinal Properties.—A warm, aromatic stimulant and carminative, like Cloves; used as an adjuvant to tonics and purgatives.

Dose.—10 to 30 grains = 0·65 to 2 grammes, in powder.

Prescribing Notes.—*The* **Oil** *may be given on* **sugar,** *or in* **pill** *with Liquorice Powder and Soap*, see p. 897.

Official Preparations.—Aqua Pimentæ and Oleum Pimentæ.

Foreign Pharmacopœias.—Official in Mex. (Pimienta Gorda); Port. (Pimenta da Jamaica); Span. (Pimienta de la Jamaica); U.S. Not in the others.

Descriptive Notes.—The official fruit is known in commerce as Allspice or Jamaica Pepper; its resemblance in shape to Pepper is also indicated by the German name, Clove Pepper (Nelkenpfeffer). Pimienta being the Spanish for Pepper, the corrupted name Pimento was applied to it in the West Indies, and the same application of the name is made in France, where Allspice is termed Piment des Anglais, and the Capsicum or Guinea Pepper, Piment des Jardins.

The fruit is dried before it ripens, since it loses much of its essential Oil when ripe. It varies in size from about $\frac{1}{10}$ to $\frac{3}{10}$ in. (2·5 to 7·5 mm.) in diameter ($\frac{1}{5}$ to $\frac{1}{3}$ in., 5 to 8 mm., *B.P.*; 5 to 7 mm., *U.S.P.*). The remains of a four-toothed calyx crown the apex of the fruit, which is two-celled, each cell containing a reniform seed with a large, spirally-coiled embryo. Both pericarp and seed contain oil cells, but they are most numerous in the former. Pimento is produced by *Pimenta officinalis*, Lindl. The fruit of the allied *P. acris*, Wight (*Myrcia acris*, DC.), is similar in appearance and sometimes occurs in commerce, but has five calyx teeth. The leaves of this species are used in the manufacture of Bay Rum, but have a flavour different from Allspice; the leaves are known in commerce as 'Bay Leaves.' A better term would be West Indian Bay Leaves, since the term Bay Leaves properly pertains to those of *Laurus nobilis*, L. The fruits of Tobago or Mexican Allspice (*Eugenia Tabasco*, G. Don) are liable to be mistaken for the official article. They are but rarely met with, but are larger, paler brown and less aromatic.

The distinctive microscopical characters of the powdered fruit are the cluster crystals and rhomboidal crystals of Calcium Oxalate; small, thick-walled cells containing Resin; short, thick-walled, simple, tapering hairs; sclerenchymatous cells with branching pores; compound small starch grains; and spherical oil cells.

Powdered Pimento is stated by Möller (*Lehrb. Pharmacognosie*, p. 144) to have been adulterated with Pear stalks and Clove stalks, and he gives the methods for detecting these adulterations.

Tests.—Pimento yields from 3 to 4 p.c. of ash, and should not exceed 5 p.c. It contains 3 to 4½ p.c. of volatile Oil and some quantity of Tannin.

Preparations.

AQUA PIMENTÆ.—Pimento Water.

Pimento, bruised, 4; Water, 160; distil one half. (1 in 20)

Now 1 in 20 instead of 1 in 11½.

Dose.—1 to 2 fl. oz. = 28·4 to 56·8 c.c.

OLEUM PIMENTÆ.—Oil of Pimento.

A pale yellow, or yellowish-brown, oily liquid, heavier than Water, having a pleasant, clove-like odour and pungent spicy taste, distilled from Pimento. Yield about 3 to 4½ p.c.

On exposure to the air the colour darkens and the oil becomes thicker. It should therefore be kept in well-stoppered bottles of a dark amber tint and protected from the light. It contains a large percentage of Eugenol and a sesquiterpene.

Solubility.—In all proportions of Alcohol (90 p.c.).; about 1 in 50 of Alcohol (60 p.c.).

Dose.—½ to 3 minims = 0·03 to 0·18 c.c.

Not Official.—Spiritus Myrciæ, Spiritus Pimentæ.

Foreign Pharmacopœias.—Official in U.S. Not in the others.

Tests.—Oil of Pimento has a sp. gr. of 1·030 to 1·050. The *B.P.* states not below 1·040, the *U.S.P.* from 1·033 to 1·048 at 25° C. (77° F.). It is officially required to form a semi-solid mass when shaken with an equal volume of strong Ammonia Solution. The *U.S.P.* requires that it shall form a semi-solid mass when mixed with an equal volume of concentrated Sodium Hydroxide Solution, that it shall be miscible in all proportions with Alcohol (90 p.c.) and also soluble 1 in 2 of Alcohol (70 p.c.). 1 minim dissolved in 60 minims of Alcohol (90 p.c.) and treated with 1 minim of very dilute Ferric Chloride Solution assumes a fine indigo colour. Oil of Cloves, which Oil of Pimento very much resembles in chemical constitution, also conforms to this test. It has been recommended that the Oil be required to indicate 65 p.c. of Eugenol by the Potassium Hydroxide method. The *U.S.P.* Oil is required to contain not less than 65 p.c. by volume of Eugenol as determined by measuring the portion undissolved when a measured quantity of 10 c.c. of the Oil is shaken for 5 minutes with 100 c.c. of Potassium Hydroxide T.S., the liquids being allowed to separate, sufficient Potassium Hydroxide T.S. added to raise the lower limit of the oily layer to the zero mark on the scale; a volume of not more than 3·5 c.c. should remain unabsorbed.

Not Official.

SPIRITUS MYRCIÆ. Bay Rhum.—Oil of Myrcia, 0·8; Oil of Orange Peel, 0·05; Oil of Pimenta, 0·05; Alcohol (95 p.c.), 61; Water, *q.s.* to make 100.—*U.S.P.* 1890.

Spiritus Pimentæ. *Syn.* Spiritus Myrciæ. Bay Rhum. Oil of Pimento Leaves, 0·75; Oil of Orange Peel, 0·05; Oil of Pimento, 0·05; Alcohol (90 p.c.), 64; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

PINI OLEUM.

OIL OF PINE.

Colourless, or pale yellow, limpid oily liquid, possessing an agreeable characteristic pine odour. It is distilled from the fresh leaves of *Pinus Pumilio*, Haenke.

It should be kept in well-closed glass bottles preferably of a dark amber tint.

Pine Oil contains Pinene, Lævo-phellandrene, Sylvestrene, Bornyl Acetate, Dipentene, and Cadinene.

'Pinol' and 'Pumiline' are commercial varieties of this Oil.

Solubility.—About $\frac{4}{5}$ dissolves 1 in 5 of Alcohol (90 p.c.), but the remaining $\frac{1}{5}$ is much less soluble.

Medicinal Properties.—The vapour or spray is a stimulating disinfectant expectorant in chronic catarrhal affections of the respiratory passages. The Oil is applied externally in rheumatism. Internally, as a disinfecting expectorant, the dose is 1 to 5 minims taken on sugar, or in the form of jujube or pastil.

Dose.—1 to 5 minims = 0·06 to 0·3 c.c.

Not Official.—Extractum Pini Pumilionis, Linctus Pini Terpin et Heroin, Elixir Pini et Terpini et Acetomorphinæ, Syrupus Pini Pumilionis and Vapor Olei Pini.

Foreign Pharmacopœias.—Official in Austr. and Swiss. Not in the others.

Tests.—Pine Oil has a sp. gr. of from 0·865 to 0·875; the *B.P.* gives 0·865 to 0·870. It is lævogyrate, the optical rotation being from −5° to −9°; the *B.P.* states −5° to −10° at 15·5° C. (60° F.). The *B.P.* requires that not more than 10 p.c. should distil below 165° C. (329° F.).

Not Official.

EXTRACTUM PINI PUMILIONIS.—A liquid extract, of a brown colour, prepared from the young shoots of the *Pinus Pumilio*. It is soluble in Water, and is used in baths.

LINCTUS PINI TERPIN ET HEROIN. *Syn.* Elixir of Pine Terpine and Heroin.—Pine Oil, 1 fl. oz.; Alcohol (90 p.c.), 5 fl. oz.; Terpine Hydrate, 40 grains; Glycerin, 5 fl. oz.; Light Magnesium Carbonate, 3 oz.; Saffron Tincture, 5 drm.; Heroin Hydrochloride, 3½ grains; Syrup, *q.s.* to make 20 fl. oz. —*Martindale.*

Dissolve the Terpine Hydrate in the Alcohol, and Heroin Hydrochloride in the Syrup, and proceed as in preparing Syrupus Pini Pumilionis.

Elixir Pini et Terpini et Acetomorphinæ. *Syn.* Linctus Pini et Terpini et Acetomorphinæ.—Oil of Pine, 5; Terpin Hydrate, 0·50; Acetomorphinæ Hydrochloride, 0·05; Alcohol, 25; Tincture of Saffron, 3; Glycerin, 25; Light Magnesium Carbonate, 15; Syrup, *q.s.* to produce 100.—*B.P.C.*

SYRUPUS PINI PUMILIONIS.—Pine Oil, 1 oz.; Alcohol (90 p.c.), 5 oz.; Saffron Tincture, 5 drm.; Glycerin, 5 oz.; Syrup, *q.s.* to make 20 fl. oz. Rub the Pine Oil with 3 oz. Light Magnesium Carbonate, then add the Alcohol, Glycerin, and Syrup, in parts, filter. Dose.—1 drm. (3·5 c.c.).—*Martindale.*

This has been incorporated in the *B.P.C.*

VAPOR OLEI PINI.—Oil of Pine, 10; Magnesium Carbonate (light), 5; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

A similar inhalation appears below under the title Vapor Olei Pini Sylvestris.

Not Official.

PINI SYLVESTRIS OLEUM.

Under this name several varieties of Pine-needle Oil are supplied.

A colourless, or nearly colourless, limpid oily liquid with an agreeable odour, distilled from the fresh Leaves of various species of *Pinus*. The Oil distilled from the leaves of *Pinus sylvestris*, L., is not now obtainable in commerce.

Solubility.—1 in 5 to 10 of Alcohol (90 p.c.), depending on the variety; in all proportions of Absolute Alcohol.

Medicinal Properties.—Similar to those of Oil of Turpentine. It is also used externally in rheumatism, and as an inhalation or spray with hot Water in chronic laryngitis, bronchitis and phthisis.

Foreign Pharmacopœias.—Official in Hung., sp. gr. 0·872; Russ. (Oleum Pini Foliorum), sp. gr. 0·870 to 0·880. Not in the others.

Tests.—The Oil should have a sp. gr. of not below 0·880. Rotation varies with the time of year at which the Oil is collected, climate and locality. Not more than 15 p.c. should distil below 170° C. (338° F.). Many Oils sold as Pinus Sylvestris yield on fractionation 60 to 70 p.c., boiling below 167° C. (332·6° F.).

VAPOR OLEI PINI SYLVESTRIS.—Oil of Scotch Pine, 40 minims; Light Magnesium Carbonate, 20 grains; Water, *q.s.* to produce 1 fl. oz.—*Throat.*

1 fl. drm. in 20 fl. oz. of Water at 140° F. for each inhalation.

PIPER NIGRUM.

BLACK PEPPER.

FR., POIVRE NOIR; GER., SCHWARZER PFEFFER; ITAL., PEPE NERO; SPAN., PIMIENTA NEGRA.

The dried unripe Fruit of *Piper nigrum*, L.

The ash of genuine Black Pepper varies from 4 to 6 p.c.
Chiefly from the East Indies.

Medicinal Properties.—Carminative and stomachic. Chiefly used to assist gastric digestion and relieve colic and flatulence. Useful in hæmorrhoids and in urethritis.

Official Preparation.—Confectio Piperis. Contained in Pulvis Opii Compositus.

Not Official.—Oleoresina Piperis, Piperina, Piperidine, Piperidine Guaiacolate, Piperidine Acid Tartrate.

Foreign Pharmacopœias.—Official in Austr., Belg., Jap., Mex. (Pimienta Negra), Port. (Pimenta), U.S. Not in the others.

Descriptive Notes.—Black Pepper consists of the dried unripe fruits of *Piper nigrum*. The fruits are black, nearly spherical, about $\frac{1}{5}$ in. (5 mm.) in diameter, wrinkled, slightly pointed below from the remains of a very short pedicel, and showing traces at the apex of a 3 to 4 lobed stigma. The single seed fills the fruit and contains a small cavity at the apex where the embryo should be developed in the ripe fruit. The albumen is horny externally and starchy inside. The taste is pungent and the flavour and odour characteristic. It is largely imported from Singapore, Malabar, (Tellicherry and Aleppy), Ceylon, Siam, and Mangalore. The last named is large and has a flavour resembling Bay Leaves. Penang Pepper is preferred for its strength and Sumatra Pepper (Acheen and Lampong) for its colour. The heavy or shot Pepper of Tellicherry and Ceylon is preferred for grinding. Black Pepper is collected as soon as the lowest fruits on the spikes turn red, since its loses some of its pungency as it ripens, although it improves in flavour. White Pepper consists of the ripe fruit with the pericarp removed by soaking in Water and rubbing. The Tellicherry and Ceylon kinds of White Pepper are considered to be the best. The Black Pepper of the *B.P.* is described as $\frac{1}{5}$ in. (5 mm.) in diameter and almost black in colour; that of the *U.S.P.* should be greyish-black, and 4 to 5 mm. in diameter.

The distinctive microscopical characteristics of Black Pepper are sclerenchymatous cells with brown contents more or less surrounded by thin-walled parenchymatous cells, and the sclerenchymatous cells of the inner layer of the pericarp, which have larger cavities that are clear, and unequally thickened walls; the small starch grains (0·002 mm. *U.S.P.*), and the oil cells.

Whole Pepper is rarely adulterated. Ground Pepper has been adulterated with Rice which has a distinctive Starch; ground Olive stones, which become yellow when boiled with Solution of Aniline in Acetic Acid; and, according to Möller, with Palm kernels, Cake, Millet, and other farinaceous substances, some illustrations of which are given in his *Lehrbuch der Pharm.* 1889, pp. 136–7.

Tests.—Black Pepper leaves on ignition from 4 to 6 p.c. of ash, and should not leave more than 7 p.c. The *U.S.P.* ash limit is 7 p.c.

It has been recommended that the characters of the powder should be given together with an ash and possibly an Oleo-resin standard. The matter soluble in hot Alcohol amounts to about 7 p.c.

Preparation.

CONFECTIO PIPERIS. CONFECTION OF PEPPER.

Black Pepper, 2; Caraway fruit, 3; Clarified Honey (by weight), 15. (1 in 10)

Dose.—60 to 120 grains = 4 to 8 grammes.

Not Official.

OLEORESINA PIPERIS (*U.S.*).—Obtained from Pepper by exhaustion with Acetone, evaporation of the solution, and finally separation of the crystals of Piperine by straining the Oleo-resin through Cotton-Wool.

Average Dose.—½ grain = 0·032 gramme.

This has been incorporated in the *B.P.C.*

PIPERINA. Piperine $C_{17}H_{19}NO_3$, eq. 283·05.—It is described in the *U.S.P.* as a feebly basic substance obtained from Pepper and other plants of the Piperaceæ. Allen describes it as an alkaloid existing in various plants belonging to the Piperaceæ, and as the characteristic principle of both black and long Pepper. It forms colourless or pale yellow four-sided monoclinic prisms, odourless, and at first tasteless, but subsequently developing a sharp biting taste. Insoluble in cold Water, very slightly soluble in boiling Water, is sparingly soluble in Ether, but dissolves readily in Chloroform and Benzene.

It possesses antipyretic properties, but it is not the active principle of Pepper.

Official in Mex.

Average Dose.—3 grains = 0·2 gramme.

Tests.—Piperine melts at 128° to 129° C. (262·4° to 264·2° F.). The *U.S.P.* states at 130° C. (266° F.). It dissolves in Alcohol, the alcoholic solution being neutral in reaction towards Litmus paper and optically inactive. It dissolves in Sulphuric Acid with the formation of an orange-red coloration, becoming brown on warming or standing and disappearing on dilution with Water. On the addition of Nitric Acid it acquires an orange-red coloration, which is turned to a blood-red colour by the addition of an excess of Potassium Hydroxide Solution. Sulphuric Acid containing about half its volume of Formaldehyde Solution produces a permanent green solution. When mixed with Sulphuric Acid containing a crystal of Potassium Bichromate a purple coloration is immediately developed, changing on stirring to a reddish-brown solution, which becomes greenish on the addition of Water. On the addition of Iodo-potassium Iodide Solution to a hot alcoholic solution acidified with Hydrochloric Acid an Iodo-compound is formed, which separates on cooling into fine steel-blue needles. When boiled with Potassium or Sodium Hydroxide Solution, Piperine undergoes saponification, being converted into Sodium Piperinate and Piperidine. Piperinic Acid melts at about 215° C. (419° F.). When ignited with free access of air Piperine should leave no weighable residue.

PIPERIDINE ($C_5H_{11}N$, eq. 84·49).—A colourless limpid liquid. Possessing a strongly alkaline reaction and a strong odour resembling Pepper. It is a powerful base, produced by the hydrolysis of Piperine, the alkaloid occurring in Pepper, or synthetically by the reduction of Pyridine by nascent Hydrogen.

Tests.—It boils at 106° C. (222·8° F.), and distils unchanged at that temperature. It dissolves readily in Water and Alcohol, the solution possessing a strongly alkaline reaction towards blue Litmus paper. It may be determined by titration with Normal or Tenth-normal Volumetric Hydrochloric or Sulphuric Acid Solution, using either Litmus or Methyl Orange Solution as an indicator of neutrality. 1 c.c. of Normal Volumetric Acid Solution is equivalent to 0·08449 gramme of Piperidine. It rapidly absorbs Carbon Dioxide from the air.

PIPERIDINE GUAIACOLATE (Guaiaperol).—A compound of Piperidine and Guaiacol. A yellowish-white crystalline body, having a faint odour of Guaiacol. Soluble in Water. Mineral acids and alkalis decompose it into its constituents. Recommended in phthisis.—*B.M.J.* '97, i. 136; *J.C.S. Trans.* '98, 145.

Dose.—5 to 30 grains = 0·32 to 2 grammes.

PIPERIDINE ACID TARTRATE.—A white crystalline powder possessing a faint odour. Readily soluble in Water. Introduced as a solvent for gouty deposits, Uric Acid gravel and calculi. It increases the solvent power of serum for Sodium Biurate to a much larger extent than Piperazine, Lysidine or Urotropine.—*L.* '98, ii. 198, 280, 345, 433, 507.

Dose.—10 to 15 grains = 0·65 to 1 gramme.

Calcusol is stated to be a mixture of Piperidine Para-Sulphamine Benzoate and Potassium Bicarbonate.

Not Official.

PIPERAZINE.

HEXAHYDROPYRAZINE.

$(C_2H_4NH)_2$, eq. 85·52.

Colourless deliquescent crystals, readily soluble in Water.

Piperazine (Diethylene-diamine) is produced by action of Ammonia on Ethylene Bromide or Chloride. Or by reducing Ethyleneoxamide by Zinc dust or metallic Sodium.

Medicinal Properties.—It has in the laboratory a powerful solvent action on Uric Acid, the Piperazine Urate being about seven times more soluble than Lithium Urate, but whether it has a similar action in the body is doubtful. Recommended for gouty conditions, rheumatoid arthritis, and renal calculus and colic.—*T.G.* '93, 19; '94, 192; '95, 99; *B.M.J.* '94, i. 1291; *B.M.J.E.* '93, ii. 20; *Pr.* li. 134; liii. 265.

Little or no effect in gouty states.—(Sir Wm. Roberts and Bohland) *Pr.* liii. 50; in diabetes.—*B.M.J.E.* '93, ii. 72; action as a Uric Acid solvent.—*B.M.J.* '96, ii. 1901.

Piperazine did not delay the conversion of gelatinous Sodium Biurate into the crystalline variety, and the conversion when once started was but slightly slowed by the presence of this substance.—*B.M.J.* '00, i. 836; *L.* '00, i. 931. 0·05 gramme dissolved in 0·5 c.c. Water, injected in gouty tophi.—*B.M.J.E.* '99, ii. 56.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Prescribing Notes.—*Usually given in* **mixture,** *also in aerated Water, or as a* **granular effervescent** *preparation, containing* 2½, 5, *and* 10 *grains respectively in each* 60 *grains.*

Foreign Pharmacopœias.—Official in Fr.

Tests.—Piperazine melts when anhydrous at 104° to 107° C. (219·2° to 224·6° F.); *Fr. Codex* gives 104° C. (219·2° F.). It boils at 145° C. (293° F.); *Fr. Codex* gives between 145° and 146° C. (293° and 294·8° F.). It mixes readily in Water, the aqueous solution having a strongly alkaline reaction towards red Litmus paper. On the addition of Potassium Bismuth Iodide Solution to a dilute slightly acid solution a pomegranate-red precipitate is thrown down. On the addition of Picric Acid Solution a yellow crystalline precipitate exhibiting a characteristic microscopical appearance is thrown down. A glass rod moistened with Hydrochloric Acid gives off dense white clouds when held over a crystal of Piperazine. The aqueous solution affords with Potassio-mercuric Iodide (Mayer's) Solution a white precipitate; with Mercuric Chloride Solution a white precipitate; with Tannic Acid Solution an amorphous precipitate soluble in hot Water. The aqueous solution when acidified with Hydrochloric Acid yields with Platinic Chloride Solution a reddish-yellow precipitate, and if the solution be not too dilute Gold Chloride Solution throws down a crystalline double salt soluble in hot Water. Piperazine is not altered by aqueous Chromic Acid Solution, but Potassium Permanganate oxidises it quickly in the cold. Piperazine absorbs Carbonic Acid rapidly from the air, being converted into the Carbonate which melts at 162° to 165° C. (323·6° to 329° F.). It should yield no brown or reddish-brown coloration with Alkaline Potassio-mercuric Iodide (Nessler's) Solution, indicating the absence of Ammonium salts. When acidified with Nitric Acid the aqueous solution should yield neither a turbidity nor precipitate with either Silver Nitrate Solution or Barium Nitrate Solution, indicating the absence of Chlorides and Sulphates. When strongly heated it should completely sublime without leaving a weighable residue indicating the absence of mineral impurities.

LYCETOL (Dimethylpiperazine Tartrate).—A white powder readily soluble in Water, possessing an acid taste. Recommended in chronic gout and rheumatism.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

LYSIDINE (Ethylene-ethenyl-diamine).—A reddish-white, crystalline substance, very hygroscopic, with a peculiar odour. Commercially it is sold in the form of a 50 p.c. solution.

A diuretic, recommended in gout and as a solvent of Uric Acid deposits.—*B.M.J.* '96, ii. 901.

It has an influence in increasing the solvent power of serum for Sodium Biurate and of urine for uratic deposit.—*L.* '98, ii. 203.

Though it delayed the conversion of the gelatinous Sodium Biurate into the crystalline form, yet when the conversion was once started it had practically no effect in slowing it.—*L.* '00, i. 931; *B.M.J.* '00, i. 836.

Dose (of the liquid).—30 to 60 minims = 1·8 to 3·6 c.c., well diluted with Water or aerated Water.

Lysidine Acid Tartrate.—A white powder soluble in Water.

Dose.—15 to 30 grains = 1 to 2 grammes.

Piperazine Quinate or **Kinate** (Sidonal).—A white granular powder, readily soluble in Water, the solution having a pleasant slightly acid taste. Recommended as a solvent of Uric Acid and gouty deposits.—*B.M.J.* '01, i. 1408.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

New Sidonal (Quinic Anhydride).—A white, crystalline powder, readily soluble in Water. Introduced for the treatment of gout.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Not Official.

PISCIDIA.

Syn.—JAMAICA DOGWOOD.

The Root-bark of *Piscidia erythrina*, Lam.

The shrub is a native of South America and the West Indies, where it has been used for stupefying fish.

Medicinal Properties.—A sedative in nervous irritability and in irritant cough; an antispasmodic in asthma.

Has been used in neuralgia and toothache.—*P.J.* (3) xvi. 1014.

Official in Mex. (Colorin de peces).

EXTRACTUM PISCIDIÆ LIQUIDUM.—1 fl. oz. is equal to 1 oz. of the root.

Dose.—30 to 120 minims = 1·8 to 7·1 c.c.

Extractum Piscidiæ.—The above evaporated to an extract for pills. **Dose, 1 to 5 grains = 0·06 to 0·32 gramme.**

PIX BURGUNDICA.

BURGUNDY PITCH.

Fr., Poix de Bourgogne; Ger., Fichtenharz; Ital., Pece di Borgogna; Span., Pez de Borgona.

An opaque or translucent yellowish- or reddish-brown brittle solid, possessing a terebinthinate odour. Imported from Germany. The prepared resinous exudation obtained from the stem of *Picea excelsa*, Link.

It is the Thus or Frankincense of Lond. and Dub. Pharmacopœias. It exudes from the spruce fir, and when melted and strained is called Burgundy Pitch.

Solubility.—Almost entirely dissolves 1 in 20 of Alcohol (90 p.c.); the greater part dissolves 1 in 1½ of Glacial Acetic Acid.

Medicinal Properties.—The plaster is applied to the chest in chronic pulmonary complaints, to the loins in lumbago, to the joints in chronic articular affections, and to other parts to relieve local pain of a rheumatic character. It acts as a counter-irritant.

Official Preparation.—Emplastrum Picis.

Foreign Pharmacopœias.—Official in Belg. (Pix Burgundica); Fr. (Poix de Bourgogne); Hung. (Resina Pini Burgundica); Ital. (Pece di Borgogna); Mex. and Span. (Pez de Borgona); Port. (Pez de Borgonha); Swiss (Resina Pini). Not in Austr., Dan., Dutch, Ger., Jap., Norw. or Russ.

Descriptive Notes.—True Burgundy Pitch is rarely met with in English commerce, its place being taken by a factitious article made with ordinary Resin, Turpentine and Palm Oil, and sold in bladders. The genuine article is produced in Finland and the Black Forest and, as described by Hanbury, has an agreeable aromatic odour, but when old it recalls that of Castoreum. It is opaque, yellowish-brown, brittle and hard, but gradually takes the form of the vessel in which it is kept; has a clean conchoidal fracture and gives off an aromatic odour when heated; it does not exhibit a crystalline structure. The fat present in the factitious article will not dissolve in Glacial Acetic Acid; the taste should be sweet, aromatic and without bitterness.

Tests.—Burgundy Pitch is officially required to be readily soluble in Glacial Acetic Acid.

Preparation.

EMPLASTRUM PICIS.—Pitch Plaster.

Burgundy Pitch, 26; Frankincense, 13; Resin, 4½; Yellow Beeswax, 4½; Olive Oil (by weight), 2; Distilled Water, 2; melt and evaporate to the consistence of a plaster.

The Expressed Oil of Nutmeg is omitted in *B.P.* 1898.

Foreign Pharmacopœias.—Official in Fr., Port. and Span. Yellow Wax 1, Burgundy Pitch 3; Ital. (Empiastro Adesivo), Yellow Wax 3, Burgundy Pitch 7, Diachylon Plaster 40; Mex. (Emplasto Aglutinante), Pitch 74, Elemi 10, Sesame Oil 6, Yellow Wax 10. Not in the others.

PIX CARBONIS PRÆPARATA.

PREPARED COAL TAR.

Prepared from commercial Coal Tar by dissipating all constituents volatile below 120° F. (48·9° C.), by keeping it at that temperature for 1 hour in a shallow vessel.

The **solution** is used in chronic eczema as a Lotion, 1 to 20 or more of Water, or as an Ointment 1 to 8. It is frequently prescribed with the Liquor or the Glycerole of Lead.

Official Preparation.—Liquor Picis Carbonis.

Not Official.—Liquor Carbonis Detergens, Lotio Plumbi et Picis, Plâtre coaltaré (Vet.), Unguentum Picis Carbonis, Unguentum Picis Carbonis Compositum, Unguentum Petrolati Compositum.

Foreign Pharmacopœias.—Official in Dutch and Swiss (Pix Lithanthrasis); Fr. (Goudron de Houille). Not in the others.

Preparation.

LIQUOR PICIS CARBONIS.—Solution of Coal Tar.

Digest for 2 days at 120° F. (48·9° C.) 1 (by weight) of Prepared Coal Tar in 5 of a Tincture of Quillaia (1 in 10, Alcohol 90 p.c.); decant or filter when cold. (1 in 5)

Foreign Pharmacopœias.—Liquor Picis Lithanthracis:—Pix Lithanthracis 1, Alcohol (90 p.c.) 1.—*Dutch.*

Not Official.

LIQUOR CARBONIS DETERGENS.—An Alcoholic solution of Coal Tar. It is almost black, smells strongly of Naphthalene, and is of light sp. gr. Used externally in chronic scaly skin diseases diluted about 1 in 20 of Water.

Coal Tar in dermatological practice.—*B.M.J.E.* '94, ii. 88.

LOTIO PLUMBI ET PICIS.—Strong solution of Lead Acetate, 10 minims; Solution of Coal Tar, 20 minims; Water, to 1 fl. oz.—*London.*

PLÂTRE COALTARÉ (Vet.).—Coal Tar, 1; Calcium Sulphate (Moulder's Plaster), 20.—*Fr.*

UNGUENTUM PICIS CARBONIS.—Solution of Coal Tar, ½ fl. drm.; Soft Paraffin, yellow, to 1 oz.—*St. Thomas's.*

Solution of Coal Tar, by weight, 6; Soft Paraffin, yellow, *q.s.* to produce 100.—*B.P.C.*

UNGUENTUM PICIS CARBONIS COMPOSITUM.—Solution of Coal Tar, ½ fl. drm.; Ammoniated Mercury, 15 grains; Soft Paraffin, yellow, to 1 oz.—*St. Thomas's.*

Solution of Coal Tar, by weight, 6; Ammoniated Mercury, 3; Soft Paraffin, yellow, *q.s.* to produce 100.—*B.P.C.*

Unguentum Petrolati Compositum.—Solution of Coal Tar, ½ drm.; Ammoniated Mercury, 10 grains; Soft Paraffin, to 1 oz.—*St. John's.*

PIX LIQUIDA.

TAR.

FR., GOUDRON VÉGÉTAL; GER., HOLZTHEER; ITAL., CATRAME VEGETALE; SPAN., BREA.

A thick, dark brown or brownish-black, bituminous fluid or semi-fluid, having a strong, peculiar, empyreumatic terebinthinate odour. Obtained by destructive distillation from the wood of *Pinus sylvestris* and other species of *Pinus*; *U.S.P.* says *Pinus palustris.* Known commercially as Stockholm Tar.

Wood Tar contains Guaiacol and Cresol. Coal Tar yields Phenol and Cresol.

Solubility.—In less than its own bulk of Alcohol (90 p.c.) or Chloroform, and separates on the addition of Water; soluble 1 in 3 of Solution of Sodium Hydroxide (4 p.c.); slightly soluble in Olive Oil or Oil of Turpentine.

Medicinal Properties.—Similar to Turpentine. May be used as a disinfectant expectorant in chronic bronchitis and winter cough, taken internally or inhaled from steaming Water. The ointment is used in leprosy, pruritus, and also for some chronic skin diseases, such as eczema and psoriasis.

Dose.—5 to 10 minims = 0·3 to 0·6 c.c.; but the dose may be increased gradually.

Prescribing Notes.—*Best given in* **capsules.** *Tar varies slightly in consistence, and is very difficult to form into pills of a convenient size; it requires so much excipient, that a 5-grain pill will contain very little Tar. Powdered Liquorice Root and Lycopodium have been recommended for the purpose, but neither of them alone yields a satisfactory mass. Equal weights of Tar, Curd Soap, Powdered Liquorice Root, and Powdered Gum Acacia, make a good plastic pill; the quantity of Tar which can be worked up with this mixture will vary according to the consistence of the Tar.*

Official Preparation.—Unguentum Picis Liquidæ.

Not Official.—Unguentum Picis Molle, Aqua Picis, Capsulæ Picis, Oleum Picis Liquidæ, Oleum Picis Rectificatum, Pigmentum Picis Liquidæ, Pilulæ Picis, Syrupus Picis Liquidæ, Sirupus Picis cum Codeino, Vasolimentum Picis, Parogenum Picis, Black Pitch.

Foreign Pharmacopœias.—Official in all; Dan., Norw. and Swed. (Pyroleum Pini); Fr. (Goudron végétal), obtained from *Pinus maritima;* Ital. (Catrame vegetale); Mex. (Alquitran); Port. (Alcatrao); Span. (Brea); Russ. has Pix Solida also.

Descriptive Notes.—Official Tar is commonly known in commerce as Wood Tar, Archangel or Stockholm Tar, to distinguish it from Coal Tar. It is obtained by destructive distillation of the stumps and roots, chiefly of *Pinus sylvestris*, L., and *Abies Sibirica*, Ledeb., in Northern Europe. Some varieties exhibit colourless crystals of Pyrocatechin, to which it owes its occasionally granular appearance. The Pix Liquida of the *U.S.P.* is derived from *Pinus palustris*, Miller, and other species.

Tests.—Tar is required by the *B.P.* to have a sp. gr. of 1·02 to 1·15; the *P.G.* and *U.S.P.* state that it is heavier than Water. When shaken with Water the aqueous solution acquires a light brown colour and a sharp and empyreumatic taste. The aqueous liquid has an acid reaction towards blue Litmus paper and affords, with dilute Ferric Chloride T.S., a red coloration. According to the *P.G.*, 20 c.c. of Water which has been shaken with Tar assumes a greenish-brown coloration on the addition of 2 drops of Ferric Chloride T.S. The *P.G.* states that a mixture of equal volumes of Lime Water in which Tar has been shaken and Lime Water assumes a dark brown colour. When ignited with free access of air it should leave no weighable residue.

Preparation.

UNGUENTUM PICIS LIQUIDÆ.—TAR OINTMENT.
Tar (by weight), 5; Yellow Beeswax, 2.

This ointment is too hard for use. A proper consistence is obtained by replacing half of the Yellow Beeswax with Almond Oil (*see* Ung. Picis Molle).

Foreign Pharmacopœias.—Official in Dan., Pitch 9, Lard 6, Potassium Carbonate 3, Water 2; Dutch (Ung. Picis), Pix Solida 3, Colophonium 3, Yellow Wax 2, Sesame Oil 12; also Ung. Picis Co.; Fr. (Pommade de Goudron), and Port., Tar 1, Lard 9; Jap., Wood Tar 10, Yellow Wax 4; Span., Tar 3, Lard 17; U.S., Tar 50, Yellow Wax 15, Lard 35. Not in the others.

Not Official.

UNGUENTUM PICIS MOLLE.—Tar (by weight), 5; Yellow Beeswax, 1; Almond Oil, 1; melt together and stir till cold.

AQUA PICIS (TAR WATER, AQUA PYROLEI PINI, ACQUA DI CATRAME, EAU DE GOUDRON).—Tar, 1; finely powdered, washed and dried Pumice, 3; Distilled Water, 200; agitate for 15 minutes, and filter.

Dose.—From 1 to 2 pints daily, or may be used as a wash for ulcers and wounds.

The *B.P.C.* adopts the strength given in *Ph. Ger.*, Tar 1, Water 10.

Foreign Pharmacopœias.—Official in Dutch, Tar 1, Pumice 3, Water 20; Fr. (Eau de Goudron), Tar 1, Calcined Sand 3; Water 200; Ger., Jap. and Swiss, Tar 1, Pumice 3, Water 10; Norw. (Aqua Pyrolei Pini), 1 in 10; Mex. (Aqua de Alquitran), Tar 5, Pumice 15, Water 1000; Port. (Agua de Alcatrao), and Ital. (Acqua di Catrame), 1 in 40; Span. (Agua de Brea), 1 in 33, also (Solucion de Brea Alcalina), Bicarbonate of Soda 20, Tar 40, Distilled Water 85; Russ., Birch Tar 1, Water 30. Not in Austr., Hung., or U.S.

CAPSULÆ PICIS.—Capsules containing 5 minims = 0·3 c.c.

Dose.—1 or 2 capsules.

OLEUM PICIS LIQUIDÆ (Oil of Tar).—This volatile Oil, distilled from Tar, is official in U.S. as an almost colourless liquid when first distilled, but becoming dark reddish-brown on keeping; sp. gr. about 0·892 at 25° C. (77 F.).

OLEUM PICIS RECTIFICATUM (Light Oil of Tar).—Colourless when first distilled, becoming brown on keeping; sp. gr. 0·840 to 0·870.

PIGMENTUM PICIS LIQUIDÆ.—Tar, 1; Alcohol (90 p.c.), 1.

Used as a stimulant in psoriasis and chronic dry eczema. Its use in eczema demands caution.

PILULÆ PICIS.—Tar, Curd Soap, powdered Liquorice Root, and powdered Gum Acacia, equal weights mixed, and made into 5-grain pills.

Dose.—2 or 3 pills thrice daily.

They are sometimes made of Black Pitch, and have been taken to relieve hæmorrhoids.

SYRUPUS PICIS LIQUIDÆ.—Tar, 0·5; Alcohol (95 p.c.), 5; Magnesium Carbonate, 1; Sugar, 85; Water, *q.s.* to produce 100.—Mix the tar intimately in a mortar with 1 of clean white Sand, add 10 of Water, and after kneading the mass thoroughly with the pestle pour off the Water and throw it away. Treat the residue with the Alcohol, and when the Tar is dissolved add the Magnesium Carbonate and 5 of Sugar, and after thorough trituration add 40 of Water, stir occasionally during 2 hours and filter, dissolve the remainder of the Sugar in the clear filtrate by gentle heat, strain and add sufficient Water to make the product 100.—*U.S.P.*

This has been incorporated in the *B.P.C.*

Dose.—1 to 2 fl. drm. = 3·6 to 7·1 c.c.

Sometimes prescribed with Syrup of Wild Cherry Bark, and also with Codeine.

Foreign Pharmacopœias.—Official in Fr. (Sirop de Goudron), Tar 10, Calcined and washed Sandstone 15, Distilled Water 1000; Sugar in proportion of 18 to 10 of the liquid; Span., Solucion de Brea Alcalina 12, Tar Water 24, Saccharum 64.

SIRUPUS PICIS CUM CODEINO.—Codeine 0·1, Proof Spirit *q.s.*; Syrup Picis Liquidæ to make 100. Dose.—½ to 2 fl. drm.—*Swiss* 1893.

Tar Water, 324; Sugar, 505; Glycerin, 150; Codeia, 1; Diluted Spirit (Alcohol 60 p.c.), 20.—*Swiss* 1907.

VASOLIMENTUM PICIS.—Tar, 25; dissolved in Alcoholic Ammonia, 25; Simple Vasoliment, 75; mixed, evaporated on a water-bath to 100, and filtered —*Y.B.P.* 1901, 212, and *Hager*.

Parogenum Picis. *Syn.* Tar Vasoliment.—Tar, 25; Parogen, *q.s.* to produce 100.—*B.P.C.*

BLACK PITCH.—There are three kinds, Archangel, Swedish, and that obtained from Gas Tar; the latter is without odour.

Not Official.

PLUMBUM.

LEAD.

Pb, eq. 205·35.

Lead occurs in nature as an Oxide, and as a Sulphide called *Galena*; also in saline combination, forming the native Lead Sulphate, Phosphate, Carbonate, Chromate, Molybdate, Tungstate, and Arsenate. The native Oxide is rare, but Galena, the ore from which nearly all the Lead of commerce is extracted, is exceedingly abundant.

Fr., Plomb; Ital., Piombi; Mex. and Span., Plomo; Port., Chumbo.

Incompatibles.
Antidotes. } Are given after Plumbi Subacetatis Liquor Fortis, p. 919.

Tests.—Lead has a sp. gr. of 11·3, it fuses at 325° C. (617° F.). It is not affected in the cold by Sulphuric Acid, but, when heated, it dissolves with the evolution of Sulphur Dioxide. When heated in the air it is converted into Lead Oxide. It dissolves readily in diluted Nitric Acid, forming a solution which affords, with Sulphuric Acid, a white precipitate, soluble in boiling Water, reprecipitating as the solution cools. The almost neutralised solution affords, with Hydrogen Sulphide, a black precipitate, insoluble in Hydrochloric Acid, insoluble in Potassium Hydroxide Solution, and in solution of Ammonium Hydrosulphide, the black precipitate is decomposed by boiling with diluted Nitric Acid. Diluted Sulphuric Acid affords a white precipitate almost insoluble in Water and dilute Sulphuric Acid, insoluble in Alcohol (90 p.c.), but soluble in Ammonium Acetate Solution. Potassium Chromate Solution affords a yellow precipitate readily soluble in Potassium Hydroxide Solution, and in strong, hot Nitric Acid, sparingly soluble in diluted Nitric Acid, insoluble in Acetic Acid. Potassium Hydroxide Solution yields a white precipitate, soluble in excess of the reagent, insoluble in Ammonia Solution. A neutral solution affords, with

Potassium Iodide Solution, a yellow crystalline precipitate, soluble on boiling, and depositing again in brilliant golden crystals as the solution cools.

Lead salts are distinguished when in solution from those of any other metals by giving white precipitates with soluble Chlorides and Sulphates, insoluble in any dilute acid, yellow precipitates with Chromates and Iodides; a black precipitate with Hydrogen Sulphide from an acid solution. All these precipitates (except the Sulphides) are soluble in excess of hot Potassium or Sodium Hydroxide Solution.

PLUMBI ACETAS.

LEAD ACETATE.

$Pb(C_2H_3O_2)_2$, $3H_2O$, eq. 376·15.

FR., ACETATE NEUTRE DE PLOMB; GER., BLEIACETAT; ITAL., ACETATO DI PIOMBO; SPAN., ACETATO PLUMBICO.

Colourless, translucent prismatic crystals, or as masses of white monoclinic prisms possessing a faint odour of Acetic Acid and a sweet metallic and astringent taste.

It should be kept in well-closed bottles and in a cool atmosphere, as it is slightly efflorescent and liable to absorb Carbon Dioxide on exposure to the air.

Solubility.—1 in 2 of Water; 6 in 1 of boiling Water; 1 in 20 of Alcohol (90 p.c.); 1 in 2 of Glycerin.

Medicinal Properties.—In small doses it is sedative and astringent, lessening morbid mucous discharges and hæmorrhages in the gastro-intestinal and genito-urinary tracts, and even diminishing natural secretions; hence it is useful in gastric ulcer, diarrhœa, dysentery, cholera, and in tubercular and typhoid ulceration. Used in phthisis to check excessive expectoration and to allay hæmorrhage, in bronchitis to abate profuse secretion. Its prolonged use requires caution, otherwise chronic Lead poisoning may be induced. It is often accompanied or followed by a small dose of Acetic Acid, as excess of Acid makes it less injurious to the system. Externally it is sedative, desiccant, and astringent, diminishing profuse discharges of ulcers; used for injection in gonorrhœa and other chronic inflammatory discharges.

Along with Opium, or better, as Lotio Plumbi Evaporans cum Morphina, it is a favourite application for sprains and bruises. The compound Lead suppositories are used for painful and bleeding piles.

A solution of this salt with a little sublimed Sulphur is stated (*B.M.J.* '04, ii. 1749) to form an excellent test for tinea versicolor. A little of the lotion is applied to the part, and after the lapse of a short time, the tinea will appear clearly marked out in blackened patches.

In intestinal hæmorrhage 5 grains every hour.—*T.G.* '07, 324.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

Ph. Ger. maximum single dose, 0·1 gramme; maximum daily dose, 0·3 gramme.

Prescribing Notes.—*May be given in* **pills** *with* $\frac{1}{8}$ *to* $\frac{1}{4}$ *of its weight of Compound Tragacanth Powder, and massing with 'Diluted Glucose' or Dispensing Syrup, q.s. in* **solution,** *with excess of Acetic Acid; with Opium in the official Pill, and Suppository.*

Incompatibles. Sulphuric and Tannic Acids, and their salts; Chlorides, Iodides, and Phosphates.

Official Preparations.—Pilula Plumbi cum Opio, Suppositoria Plumbi Composita, and Unguentum Plumbi Acetatis. Used in the preparation of Glycerinum Plumbi Subacetatis, Liquor Plumbi Subacetatis Fortis.

Not Official.—Lotio Plumbi Acetatis.

Antidotes.—Same as under Plumbi Subacetatis Liquor.

Foreign Pharmacopœias. Official in all; Austr., Ger. and Swiss (Plumbum Aceticum); Hung and Russ. (Plumbum Aceticum Depuratum); Dan., Dutch, Norw. and Swed. (Acetas Plumbicus); Belg. (Acetas Plumbi); Fr. (Acétate Neutre de Plomb); Ital. (Acetato di Piombo); Mex. (Acetato de Plomo); Port. (Acetato de Chumbo); Span. (Acetato Plumbico).

Tests.—Lead Acetate loses its Water of crystallisation when heated to 40° C. (104° F.), suffering a loss of weight of 14·26 p.c. It dissolves in Water to form a clear solution, which should be only slightly acid in reaction towards blue Litmus paper, and which should only be slightly opalescent, the opalescence disappearing on the addition of a drop or two of Acetic Acid. The *U.S.P.* states that the aqueous solution has a neutral or slightly alkaline reaction. The *P.G.* states that the cold saturated aqueous solution of the salt has an alkaline reaction towards red Litmus paper, and on dilution a faintly acid reaction towards blue Litmus paper. The aqueous solution should answer the tests distinctive of Lead given under Plumbum. When mixed with Sulphuric Acid it evolves a strong acetous odour; when mixed with Sulphuric Acid and warmed with a small quantity of Alcohol (90 p.c.) it evolves the distinctive odour of Ethyl Acetate. It is officially required to contain 99·8 p.c. of pure crystallised Lead Acetate, as determined by precipitating 1 gramme of the salt dissolved in Water with Tenth-normal Volumetric Sulphuric Acid Solution. It should require for complete precipitation 53·1 c.c. The *U.S.P.* requires it to contain not less than 99·5 p.c. of pure Lead Acetate, but does not give a method by which this percentage can be assured. The *P.G.* gives neither a requisite percentage of pure Acetate nor a method of determination. The use of Normal Volumetric Oxalic Acid Solution in the place of Normal Volumetric Sulphuric Acid Solution has been recommended (*P.J.* '98, ii. 531) as a more useful method of determining the amount of pure Lead Acetate present. The excess of Normal Volumetric Oxalic Acid Solution may be titrated by Tenth-normal Volumetric Potassium Permanganate Solution. This volumetric process has been adopted by the *U.S.P.* for the assay of the Lead Subacetate Solution.

The more generally occurring impurities are Copper, Iron, Zinc, Calcium, Magnesium, and salts of the alkali metals and Carbonates. The formation of a clear solution when the salt is dissolved in Water precludes the presence of Carbonates. The Potassium Ferrocyanide test described below indicates Iron and Copper if present. A test for the presence of Zinc, and an additional test for Iron, is afforded by Hydrogen Sulphide and Ammonia Water; the test is described below. Calcium, Magnesium, and the salts of the alkali metals, if present, may be detected in the filtrate from this test.

Potassium Ferrocyanide.—Lead Acetate should give a clear, or at most only faintly opalescent, solution with 10 parts of Water (which has been recently boiled, *U.S.P.*) and this solution should yield, with Potassium Ferrocyanide, a pure white precipitate, *P.G.* and *U.S.P.*

Hydrogen Sulphide and Ammonia Water.—If the Lead be precipitated from an aqueous solution of the salt, first by Hydrochloric Acid until precipitation ceases, then filtering and adding Hydrogen Sulphide and filtering again, a portion of the second filtrate should not be affected by the addition of a slight excess of Ammonia Water.—*U.S.P.*

Residue.—Another portion of this second filtrate as above, when evaporated to dryness, should leave no residue.—*U.S.P.*

Preparations.

PILULA PLUMBI CUM OPIO. PILL OF LEAD WITH OPIUM.

Lead Acetate, 12; Opium, 2; Syrup of Glucose, about 1.

Dose.—2 to 4 grains = 0·13 to 0·26 gramme.

A 4-grain pill contains about 3 grains of Plumbi Acetas and ½ grain of Pulvis Opii.

Foreign Pharmacopœias.—Official in Port., Lead Acetate, 5; Extract of Opium, 1; Extract of Liquorice, 14. Not in the others.

SUPPOSITORIA PLUMBI COMPOSITA. COMPOUND LEAD SUPPOSITORIES.

3 grains of Lead Acetate, and 1 grain of Opium, in each with Oil of Theobroma.

UNGUENTUM PLUMBI ACETATIS. LEAD ACETATE OINTMENT.

Lead Acetate, in fine powder, 20 grains; Paraffin Ointment, white, 480 grains. (1 in 25)

Foreign Pharmacopœias.—Official in Austr., Lead Acetate 1, Water 9, Wool Fat 45, Vaseline 45; Hung., Lead Acetate 3, Lard 150, White Wax 50, Water 10; Dan., Lead Acetate 1, Benzoated Lard 9; Norw., Lead Acetate 1, Olive Oil 14, Yellow Wax 5. Not in the others.

Not Official.

LOTIO PLUMBI ACETATIS.—Lead Acetate, in powder, 2 grains; Diluted Acetic Acid, 2 minims; Distilled Water, up to 1 fl. oz.—*London Ophthalmic* 1887, omitted in 1901.

This has been incorporated in the *B.P.C.*

PLUMBI CARBONAS.

LEAD CARBONATE.

$2PbCO_3, Pb(OH)_2$, eq. 768·91.

FR., CARBONATE DE PLOMB; GER., CERUSSA; ITAL., CERUSSA;
SPAN., ALBAYALDE O CERUSA.

An odourless and tasteless heavy white opaque powder, or in readily pulverisable masses.

Solubility.—Insoluble in Water; soluble, with effervescence, in Diluted Nitric Acid and in Diluted Acetic Acid.

Medicinal Properties.—Employed externally as an astringent and sedative, or as an ointment for ulcers and inflamed and excoriated surfaces.

Official Preparation.—Unguentum Plumbi Carbonatis.

Foreign Pharmacopœias.—Official in Austr., Hung. and Jap. (Plumbum Carbonicum); Ger. and Swiss (Cerussa); Dan., Norw. and Swed. (Hydratocarbonas Plumbicus); Dutch (Carbonas Plumbicus); Mex. (Carbonato de Plomo); Port. (Alvaiade); Russ. (Plumbum Carbonicum Basicum); Span. (Albayalde Cerusa). Not in the others.

Tests.—Lead Carbonate is officially required to be completely soluble in diluted Acetic Acid, Carbon Oxide gas being simultaneously evolved. This gas when passed into Lime Water affords a precipitate soluble in a sufficient excess of the gas, and also redissolving in dilute mineral acid. The solution answers the tests distinctive of Lead given under Plumbum. It is official in the *P.G.*, but not in the *U.S.P.* The *P.G.* requires that it shall leave not less than 85 p.c. of Lead Oxide when ignited at a dull red heat. It may also contain Copper, Iron and matter insoluble in diluted Nitric Acid, such as siliceous material, Barium Sulphate, etc., in addition to Calcium, Magnesium or Zinc. Calcium, Magnesium and Zinc may be detected, if present, by applying the usual tests for these metals after the separation of the Lead from the acidified solution by Hydrogen Sulphide. Copper and Iron may be detected by the Potassium Ferrocyanide test described below. Siliceous matter may be detected by the residue remaining insoluble in a mixture of Nitric Acid and Water as described below.

Residue.—The solution of the salt in Acetic Acid, after removal of the Lead by Hydrogen Sulphide gives a filtrate which, on evaporation to dryness, should not leave a weighable residue, *P.G.*

If 1 gramme of the salt be dissolved in 2 c.c. of Nitric Acid with the addition of 4 c.c. of Water, not more than 0·01 gramme should be insoluble, *P.G.*

Potassium Ferrocyanide.—Sodium Hydroxide T.S. produces in the above solution a precipitate soluble in excess of the reagent. This alkaline solution, with excess of Sulphuric Acid and filtering, gives a filtrate which should not be affected by T.S. of Potassium Ferrocyanide, *P.G.*

Preparation.

UNGUENTUM PLUMBI CARBONATIS. Lead Carbonate Ointment.

Lead Carbonate, 1; Paraffin Ointment, white, 9.

Foreign Pharmacopœias.—Official in Austr., 3 in 10; Hung., Norw., Russ. and Swed., 1 in 3; Dutch (Unguentum Carbonatis Plumbici Camphoratum) Camphor 5, Sesame Oil 5, Lead Carbonate 20, Lard 70; Mex. (Unguento Blanco simple) and Port., 1 in 5; Ger. (Emplastrum Cerussæ), Powdered Lead Carbonate 7, Olive Oil 2, Lead Plaster 12.

PLUMBI IODIDUM.

LEAD IODIDE.

PbI_2, eq. 457·15.

Fr., Iodure de Plomb; Ger., Bleijodid; Ital., Joduro di Piombo; Span., Yoduro Plumbico.

A golden yellow, odourless heavy crystalline powder. Prepared by precipitating a soluble Lead salt with Potassium Iodide solution.

The *U.S.P.* requires it to contain not less than 99 p.c. of pure Lead Iodide. It should be kept in well-closed bottles of a dark amber tint and protected as far as possible from the light.

Solubility.—Sparingly soluble in cold Water; more soluble in boiling Water; soluble also in solutions of Acetates, and of Ammonium Chloride.

Medicinal Properties.—Used externally to reduce chronic inflammatory gland and joint enlargements; also in the form of **pessaries.**

In 'dispersible' tumours of the mamma.—*B.M.J.* '94, ii. 972.

Official Preparations.—Emplastrum Plumbi Iodidi, and Unguentum Plumbi Iodidi.

Not Official.—Pessus Plumbi Iodidi, Pessus Plumbi Iodidi et Atropinæ, and Pessus Plumbi Iodidi et Opii.

Foreign Pharmacopœias.—Official in Austr. (Plumbum Iodatum); Fr. (Iodure de Plomb); Ital. (Ioduro di Piombo); Mex. (Yoduro de Plombo); Port. (Iodato de Chumbo); Swiss (Plumbum Iodatum); Span. (Ioduro Plumbico), and U.S. Not in the others.

Tests.—Lead Iodide dissolves in boiling Water, and the solution should answer the tests distinctive of Lead given under Plumbum. When strongly heated it evolves violet vapour. The hot aqueous solution affords with Silver Nitrate Solution a curdy yellow precipitate insoluble in Nitric Acid, almost insoluble in Ammonia Solution, soluble in Potassium Cyanide Solution. No method of determining the amount of pure Lead Iodide present in the sample is given in either the *B.P.* or *U.S.P.*

The more generally occurring impurities are Lead Chromate, insoluble foreign salts, Acetate, Nitrate and soluble matter of a foreign nature. The *U.S.P.* includes a test for the absence of Acetate as described below with Hydrogen Sulphide and Ferric Chloride, and a test for the limit of Nitrate with Potassium Hydroxide Solution and Aluminium wire, which is also described in small type below. Lead Chromate and insoluble foreign salts, if present, may be detected by the Ammonium Chloride test. Soluble foreign salts, if present, may be detected by evaporating to dryness a portion of the filtrate after separation of the Lead by Hydrogen Sulphide, no residue should remain.

Ammonium Chloride.—On triturating 1 gramme of the salt with 2 grammes of Ammonium Chloride and 2 c.c. of Water, a nearly white mixture will result, which, when heated in a test-tube on a water-bath for a few minutes, should give a clear and almost colourless solution, and if the above solution be cooled a solid mass of nearly colourless fine silky crystals will be produced, and, on adding Water or diluted Sulphuric Acid to this mass, Yellow Lead Iodide will separate, *U.S.P.*

Potassium Hydroxide Solution and Aluminium Wire.—Add 0·1 gramme of the salt to 5 c.c. of Water, boil the mixture, cool and filter into a test-tube of about 40 c.c. capacity, then add 5 c.c. of Potassium Hydroxide T.S. and about 0·2 gramme of Aluminium wire, insert in the upper portion of the test-tube a pledget of purified Cotton and over the mouth place a piece of moistened red Litmus paper; then, if the tube be heated on a water-bath for 15 minutes, no blue coloration of the paper should be discernible, *U.S.P.*

Hydrogen Sulphide Ammonia and Ferric Chloride.—Boil 1 gramme of the salt with 20 c.c. of Water, cool and filter, remove the Lead from the filtrate by Hydrogen Sulphide and again filter. A portion of the second filtrate after boiling and carefully neutralising with Ammonia Water should not be coloured red by a drop of T.S. of Ferric Chloride, *U.S.P.*

Preparations.

EMPLASTRUM PLUMBI IODIDI. LEAD IODIDE PLASTER.
Lead Iodide, 1; Lead Plaster, 8; Resin, 1. (1 in 10)

UNGUENTUM PLUMBI IODIDI. LEAD IODIDE OINTMENT.
Lead Iodide, in fine powder, 1; Paraffin Ointment, yellow, 9. (1 in 10)

Foreign Pharmacopœias.—Official in Fr., Mex., Port., Span. and Swiss, 1 in 10. Not in the others.

An Ointment of **Cadmium Iodide** of the same strength has been recommended as a substitute; it is said not to stain the skin.

Not Official.

PESSUS PLUMBI IODIDI.—Lead Iodide, 5 grains; Oil of Theobroma, *q.s.* for one pessary.

PESSUS PLUMBI IODIDI ET ATROPINÆ.—Lead Iodide, 10 grains; Atropine Sulphate, $\frac{1}{18}$ grain; (Gelatin) Basis, 60 grains.

PESSUS PLUMBI IODIDI ET OPII.—Lead Iodide, 5 grains; Opium, in powder, 2 grains; Oil of Theobroma, 12 grains.

PLUMBI OXIDUM.

LEAD OXIDE.

B.P.Syn.—LITHARGE.

PbO, eq. 221·23.

FR., OXYDE DE PLOMB FONDU; GER., BLEIGLÄTTE; ITAL., PROTOSSIDO DI PIOMBO; SPAN., LITARGIRIO.

In odourless and tasteless, heavy yellow or reddish-yellow scales or powder, prepared by the atmospheric oxidation of molten metallic Lead.

It should be kept in well-closed vessels. The *U.S.P.* requires that it should contain not less than 96 p.c. of pure Lead Oxide. Neither the *B.P.* nor the *P.G.* states a requisite percentage of pure Oxide.

Official Preparation.—Emplastrum Plumbi. Used in the preparation of Liquor Plumbi Subacetatis Fortis, Plumbi Acetas, and Glycerinum Plumbi

Subacetatis. **Lead Plaster** is contained in Emplastrum Hydrargyri, Emplastrum Plumbi Iodidi, Emplastrum Resinæ, and Emplastrum Saponis.

Not Official.—Emplastrum Lithargyri Compositum, Ung. Diachylon Hebræ, Ung. Diachylon Carbolisatum, Dr. Pearson's Cerate, and Plumbi Oleas.

Foreign Pharmacopœias.—Official in Austr., Hung., Russ. and Swiss (Plumbum Oxydatum); Belg. and Ger. (Lythargyrum); Dan., Norw. and Swed. (Oxydum Plumbicum); Dutch (Oxydum Plumbicum Semivitreum); Fr. (Oxyde de Plomb Fondu); Ital. (Protossido di Piombo); Jap., Mex. (Oxido de Plomo); Port. (Oxydo de Chumbo); Span. (Litargirio); U.S. (Plumbi Oxidum),

Tests.—Lead Oxide dissolves in Acetic Acid or in Diluted Nitric Acid, and the resulting solution answers the tests distinctive of Lead given under Plumbum. When heated it becomes brownish-red fusing at a red heat, and when heated with reducing substances it leaves a residue of metallic Lead. Although a content of pure Oxide is specified in the *U.S.P.*, neither this Pharmacopœia nor the *B.P.* nor *P.G.* includes a method of determination.

The more generally occurring impurities are Copper, Iron and metallic Lead, Carbonates, Silicates, Barium Sulphate, impurities insoluble and soluble in Acetic Acid, excess of moisture. The presence of Copper and Iron may be detected by the Ammonia test given below. Metallic Lead, if present, is indicated by the formation of nitrous fumes when the sample is dissolved in Diluted Nitric Acid; the presence of Carbonates by effervescence during solution. Silica, Silicates, and Barium Sulphate, if present, remain insoluble.

In testing for impurities insoluble in Acetic Acid, both the *U.S.P.* and *P.G.* treat 5 grammes of the Oxide with 5 c.c. of Water, 20 c.c. of Acetic Acid (*U.S.P.*, 36 p.c. w/w, *P.G.*, 30 p.c. w/w), boiling the mixture for a few minutes and filtering from the insoluble residue, which, when well washed and dried, should amount to not more than 4 p.c. according to the *U.S.P.*, and not more than 0·1 p.c. according to the *P.G.* In continuation of the *U.S.P.* test the mixed filtrate and washings from the insoluble matter are mixed with Hydrochloric Acid until a precipitate is no longer formed, the balance of the Lead is removed by Hydrogen Sulphide and the liquid filtered; the filtrate, when evaporated to dryness, should not leave more than 0·05 of a gramme, indicating not more than 0·1 p.c. of impurities soluble in Acetic Acid. When heated to a dull red heat in a porcelain crucible the sample, according to the *U.S.P.*, should lose not more than 4 p.c., according to the *P.G.* 1 p.c. at the most, indicating the limit of moisture and Carbonate allowed by the respective Pharmacopœias.

Ammonia.—The solution of Lead Oxide in Nitric Acid after the addition of excess of Sulphuric Acid and filtration gives a filtrate which, when supersaturated with Ammonia Water, should only assume a slight bluish tint and yield only traces of a reddish-brown precipitate, *P.G.* and *U.S.P.*

Preparation.

EMPLASTRUM PLUMBI. Lead Plaster. *N.O.Syn.*—Diachylon Plaster.

Lead Oleate with mechanically included Glycerin, obtained by boiling together Lead Oxide, Olive Oil, and Distilled Water.

Equal weights of Lead Plaster and Soap Plaster melted together form an excellent plaster for corns.

Foreign Pharmacopœias.—Official in Austr., Litharge 1, Sesame Oil 1, Lard 1; Belg., Litharge 2, Olive Oil 2, Water 1, Lard 2; Dan., Litharge 5, Olive Oil 10, Water 1; Dutch, Port. and Russ., Litharge 1, Lard 1, Olive Oil 1, Water *q.s.*; Fr., Litharge 1, Lard 1, Olive Oil 1, Water 2; Ger. and Jap., Litharge 5, Olive Oil 5, Lard 5, Water 1; Hung., Litharge 1, Lard 2; Ital., Litharge 1, Water 1, Olive Oil 2; Mex. (Emplasto Simple), Litharge 2, Lard 4, Water 3; Norw. and Swed., Litharge 1, Olive Oil 2, Water *q.s.*; Span., Litharge 1, Olive Oil 2, Water 2; Swiss, Litharge 16, Olive Oil 30, Water *q.s.*; U.S., Lead Acetate 60, Soap 100, Water *q.s.*

Not Official.

EMPLASTRUM LITHARGYRI COMPOSITUM (*Ger.*).—Lead Plaster 12, Yellow Wax 1½, Gum Ammoniacum 1, Galbanum 1, Turpentine 1.

Foreign Pharmacopœias.—Official in Belg. (Emplastrum Diachylon Gummosum), Lead Plaster 72, Yellow Wax 7, Gum Ammoniacum 7, Galbanum 7, Turpentine 7; Fr. (Emplâtre Brun), Olive Oil 10, Lard 5, Butter 5, Yellow Wax 5, Litharge 5, Purified Mutton Suet 5, Purified Black Pitch 1; also Emplâtre Diachylon Gommé, Litharge 62, Lard 62, Olive Oil 62, Water 125, Yellow Wax 12, Purified Burgundy Pitch 12, Venice Turpentine 12, Purified Ammoniacum 10, Purified Galbanum 10, Oil of Turpentine 6; Ger. (Emplastrum Fuscum Camphoratum), Red Lead or Vermilion 30, Olive Oil Commune 60, Yellow Wax 15, Camphor 1, Olive Oil 1. Ital. (Empiastro Diachilon Gommoresinoso), Lead Plaster 12, Yellow Wax 1, Gum Ammoniacum 1, Galbanum 1, Turpentine 1, Alcohol (60 p.c.) *q.s.*; Jap., Lead Plaster 12, Yellow Wax 1½, Gum Ammoniacum 1, Galbanum 1, Turpentine 1; Span. (Emplasto de Plomo Gomado), Turpentine 60, Yellow Wax 85, Galbanum 85, Gum Ammoniacum 85, Lead Plaster 735; Swiss. (Emplastrum Plumbi Compositum), Lead Plaster 72, Yellow Wax 9, Ammoniacum 6, Galbanum 6, Turpentine 7, Water *q.s.*

UNG. DIACHYLON HEBRÆ (modified by Professor Kaposi).—Simple Lead Plaster 1, Soft Paraffin 1; melt with heat.

Unguentum Diachylon (*Hebræ*) according to Hager, Hebra's original formula for this ointment was equal parts of Lead Plaster and Linseed Oil, and this formula is given in Charing Cross Hospital Pharm. (1884); but the majority of the Hospital Formulas, including Charing Cross (1904), are made with Soft Paraffin or a mixture of Hard and Soft Paraffin, whilst some employ Olive Oil. It is also known as **Unguentum Plumbi Oleatis.**

Foreign Pharmacopœias.—Official in Austr. (Unguentum Plumbi Oxydati), Litharge 20, Sesame Oil 40, Lard 40; to make Unguentum Diachylon Hebræ add 2 p.c. of Lavender Oil; Dan. (Unguentum Oxydi Plumbici), and Swed. (Unguentum Diachylon), Lead Plaster 13, Liquid Paraffin 7; Dutch (Unguentum Diachylon), Lead Plaster 1, Sesame Oil 1; Ger. and Russ. (Unguentum Diachylon), Lead Plaster 1, Olive Oil 1; Jap. (Unguentum Hebræ), Lead Plaster 1, Olive Oil 1; Mex. (Unguentum Encarnativo), Red Oxide of Lead 6, Lard 50; Swiss (Unguentum Hebræ), Lead Plaster 50, White Vaseline 43, Glycerin 7, Ethereal Tincture of Benzoin 5; U.S., Lead Plaster 50, Olive Oil 49, Lavender Oil 1.

UNGUENTUM DIACHYLON CARBOLISATUM.—Liquid Carbolic Acid 1, Diachylon Ointment 49.

DR. PEARSON'S CERATE.—Lead Plaster 4, Yellow Beeswax 1, Oil of Almonds 3. Melt and mix.

PLUMBI OLEAS.—Lead Acetate, 280 grains; dissolve in Distilled Water, 40 fl. oz.; add slowly Solution of Sodium Oleate (1 Castile Soap in 20), 20 fl. oz.; warm gently, wash by decantation, collect and dry.

Melted with equal parts of Lard, and Lard Oil or Olive Oil, to form an ointment.

PLUMBI SUBACETATIS LIQUOR FORTIS.

STRONG SOLUTION OF LEAD SUBACETATE.

B.P.Syn.—GOULARD'S EXTRACT.

FR., ACETATE BASIQUE DE PLOMB DISSOUS; GER., BLEIESSIG; ITAL., ACETATO BASICO DI PIOMBO; SPAN., ACETATO PLUMBICO LIQUIDO.

A clear colourless heavy liquid, having a sweet astringent taste. It is a solution of Lead Subacetate, $Pb_2O(C_2H_3O_2)_2$, eq. 543·74 in Water, and is prepared by boiling 5 of Lead Acetate, and 3½ of powdered Lead Oxide in 20 of distilled Water for 30 minutes, maintaining the volume of the liquid by addition of Distilled Water, filtering and making up to 20 with Distilled Water.

Medicinal Properties.—When largely diluted, as in Lotio Plumbi Evaporans or as Lotio Plumbi Evaporans cum Morphina, it is used externally as an astringent and sedative for inflammation arising from sprains, bruises, etc. Sometimes used as an astringent **gargle** (½ fl. drm. to 6 fl. oz. of Rose Water). A good astringent application to external piles is:—Strong Solution of Lead Subacetate, 2 to 3 fl. drm.; Solution of Morphine Acetate, 3 fl. drm.; Distilled Water, to 6 fl. oz.

Incompatibles.—Hard Water, mineral Acids, vegetable Acids, Alkalis, Chlorides, Iodides, all astringents, preparations of Opium, and Mucilage of Acacia.

Official Preparations.—Glycerinum Plumbi Subacetatis, Liquor Plumbi Subacetatis Dilutus, and Unguentum Glycerini Plumbi Subacetatis.

Not Official.—Ceratum Plumbi Compositum, Cremor Lithargyri, Lotio Plumbi, Lotio Plumbi cum Opio, Lotio Plumbi Evaporans, Lotio Plumbi Evaporans cum Morphina, Lotio Plumbi Lactatis, and Unguentum Plumbi Tannici.

Antidotes.—Wash out the stomach or give an emetic; Sodium or Magnesium Sulphate; liberal libations of Milk, or White of Egg mixed with Water; Opium or Belladonna in Lead colic.

A course of Potassium Iodide is useful in eliminating Lead from the system.

L. '81, ii. 779 gives an unusual source of Lead poisoning, viz., shot found in a bottle full of Port Wine; an appreciable quantity of Lead was found in solution.

Foreign Pharmacopœias.—Official in all; U.S., sp. gr. about 1·235 at 25° C. (77° F.). (Plumbum Aceticum Basicum Solutum).—Austr. and Hung., sp. gr. 1·230 to 1·240; Russ., sp. gr. 1·235 to 1·242; Belg., (Subacetas Plumbi Liquidus), sp. gr. 1·240; Dan., Norw. and Swed. (Solutio Subacetatis Plumbici), sp. gr. 1·165 to 1·170; Dutch (Solutio Acetatis Plumbici Basici), sp. gr. 1·235 to 1·240; Fr. (Acetate Basique de Plomb Dissous), sp. gr. 1·320; Ger. (Liquor Plumbi Subacetici), sp. gr. 1·235 to 1·240; Ital. (Acetato Basico di Piombo), sp. gr. 1·32; Jap., sp. gr. 1·23 to 1·24; Mex. (Acetato de Plomo Liquido), sp. gr. not given; Port. (Soluto de Subacetato de Chumbo), sp. gr. 1·260; Span. (Acetato (sub) Plumbico Liquido), sp. gr. 1·32; Swiss (Plumbum Subaceticum Solutum), sp. gr. 1·235 to 1·240.

Tests.—Strong Lead Subacetate Solution when freshly prepared has a sp. gr. of 1·277. It is officially required to possess a gravity of 1·275. The Liquor official in the *P.G.* has a sp. gr. from 1·235 to 1·240, that of the *U.S.P.* about 1·235 at 25° C. (77° F.). It possesses an alkaline reaction towards red Litmus paper; the *P.G.* states that it does not redden Phenolphthalein Solution. The *B.P.* states that it forms an opaque white jelly with Gum Acacia Mucilage; the *U.S.P.* that it affords a dense white precipitate when added to Acacia Solution. It answers the tests distinctive of Lead given under Plumbum. When treated with Sulphuric Acid it evolves a strong acetous odour, and when warmed with Acetic Acid and Alcohol (90 p.c.) a characteristic odour of Ethyl Acetate is evolved. It is officially required to indicate 23·1 p.c. w/w of pure Lead Subacetate as determined by the process indicated below. The *U.S.P.* requires that it shall contain in solution not less than 25 p.c. w/w of Lead Subacetate as volumetrically determined by the process indicated below. The Liquor should naturally be free from the impurities given under Lead Acetate and Lead Oxide. The Subacetate may be distinguished from the Normal Acetate by the test with Acacia Mucilage above.

The *P.G.* includes a test for Iron as given below with Potassium Ferrocyanide Solution. As the Liquor has a tendency to absorb Carbon Dioxide from the air, it should be kept in well-closed glass bottles and exposed as little as possible.

Potassium Ferrocyanide.—After the addition of Acetic Acid, solution of Lead Subacetate should give, with Potassium Ferrocyanide T.S., a pure white precipitate, *P.G.*

Volumetric Determination.—Dilute 10 grammes of the solution to 100 c.c. with previously boiled and cooled Distilled Water, take 13·6 (13·594) c.c. of this and add it to 35 c.c. of Tenth-normal Volumetric Oxalic Acid Solution in a graduated cylinder, shake thoroughly and dilute the mixture to 50 c.c. with Distilled Water, and again shake. After the precipitate has settled, 10 c.c. of the clear solution diluted with about 50 c.c. of Water and 5 c.c. of Sulphuric Acid added, should require not more than 2 c.c. of Tenth-normal Volumetric Potassium Permanganate Solution to produce a permanent pink tint, *U.S.P.* 17 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution should be required to completely precipitate 1 gramme of the Strong Lead Subacetate Solution, *B.P.*

Preparations.

GLYCERINUM PLUMBI SUBACETATIS. Glycerin of Lead Subacetate.

Lead Acetate, 5; Lead Oxide, in powder, 3½; Glycerin, 20; Distilled Water, 12. Mix. Boil for a quarter of an hour; filter; evaporate at a temperature not exceeding 222° F. (105·5° C.) until the product weighs 32¾, and has a sp. gr. of 1·48.

This is more conveniently made with half the quantity of the Distilled Water.

Foreign Pharmacopœias.—Official in Port., Solution 1, Glycerin 9. Not in the others.

Glycerin Lead Subacetate has a sp. gr. of 1·480 to 1·485. The *B.P.* figure 1·48.

LIQUOR PLUMBI SUBACETATIS DILUTUS. Diluted Solution of Lead Subacetate. *B.P.Syn.*—Goulard's Lotion; Goulard Water. *N.O.Syn.*—Aqua Vegeto-Mineralis Goulardi, Aqua Saturnina, Aqua de Vegeto.

Strong Solution of Lead Subacetate, 2 fl. drm.; Alcohol (90 p.c.), 2 fl. drm.; Distilled Water, *q.s.* to make 20 fl. oz. (1 in 80)

As the diluted Liquor is liable to absorb Carbon Dioxide from the air, it should be kept in well-closed bottles and exposed as little as possible. The *B.P.* solution is not specifically required to contain any definite percentage of Lead Subacetate, the *U.S.P.* must contain about 1 p.c. The *P.G.* does not include a dilute Liquor.

Foreign Pharmacopœias.—Official in Austr. (Aqua Goulardi), Solution 2, Spirit of Wine (60 p.c.) 5, Water 93, also (Aqua Plumbica), Solution 1, Water 49; Dan. and Norw. (Aqua Saturnin), Dutch (Aqua Plumbi Goulardi) and Swed. (Solutio Subacetatis Plumbici Diluta), Solution 2, Diluted Alcohol 8, Water 90; Fr. (Lotion à l'Acetate de Plomb), Solution 1, Water 50; Ger. and Swiss (Aqua Plumbi), Solution 1, Water 49; Ital. (Aqua Saturnina), Solution 1, Water 50; Hung. (Aqua Goulardi), Solution 2, Alcohol (70 p.c.) 5, Water 100, also (Aqua Plumbica), Solution 1, Water 50; Jap. (Liquor Plumbi Subacetici Dilutus), Solution 2, Water 98; Mex. (Agua de Vegeto), Solution 3, Eau de Cologne 5, Water 92; Port. (Aqua Saturnina Alcoolisida), Solution 2, Alcohol (85 p.c.) 8, Water 90, also (Aqua Saturnina), Solution 1, Water 50; Russ. (Aqua Plumbi Spirituosa), Solution 2, Water 98, also (Aqua Plumbi), Solution 1, Water 49; Span. (Agua Vegeto-Mineral), Solution 1, Alcohol (95 p.c.) 2, Distilled Water 97; U.S., Solution 4, Water to make 100.

Tests.—Diluted Lead Subacetate has a sp. gr. of 1·002. No official method is given for determining the amount of Lead Subacetate present.

UNGUENTUM GLYCERINI PLUMBI SUBACETATIS. LEAD SUBACETATE OINTMENT.

Glycerin of Lead Subacetate (by weight), 1; Paraffin Ointment, white, 5.

Foreign Pharmacopœias.—Official in Belg. (Unguent. Subacetatis Plumbi), 3 in 10; Dutch (Ung. Plumbici Basici), 1 in 4; Ital. (Pomata con Acetato di Piombe); Ger. and Swiss (Unguentum Plumbi), 1 in 10; Russ. (Ung. Plumbi Acetici), 1 in 12; Swed. (Ung. Subacetatis Plumbici), 3 in 20; U.S. (Ceratum Plumbi Subacetatis), 1 in 5. Not in the others.

Not Official.

CERATUM PLUMBI COMPOSITUM.—Solution of Diacetate of Lead, 6 fl. oz.; Beeswax, 8 oz.; Olive Oil, 20 fl. oz.; Camphor, 1 drm.—*P.L.*

This has been incorporated in the *B.P.C.* as follows:—

Camphor, 0·5; Yellow Beeswax, 23·5; Olive Oil, 58·5; Solution of Lead Subacetate, 17·5.

CREMOR LITHARGYRI.—Solution of Lead Subacetate, 1; Cream, 7. Mix. Useful in eczema.

LOTIO PLUMBI.—Strong Solution of Lead Subacetate, 2 fl. drm.; Water, *q.s.* to make 20 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

LOTIO PLUMBI CUM OPIO.—Tincture of Opium, 20 minims; Lead Lotion, to 1 oz.—*Lock.*

Tincture of Opium, 5; Lead Lotion, to 100.—*B.P.C.*

LOTIO PLUMBI EVAPORANS.—Strong Solution of Lead Acetate, 2 fl. drm.; Rectified Spirit, 1½ fl. oz.; Rose Water, to [illegible]—*Squire.*

Strong Solution of Lead Subacetate, 2 fl. drm.; Alcohol (90 p.c.), 4 fl. oz.; Water, *q.s.* to make 20 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

LOTIO PLUMBI EVAPORANS CUM MORPHINA.—The Solution given above, 7 fl. oz.; Solution of Morphine Acetate, 1 fl. oz.—*Squire.*

This is an improvement on the old Lead and Opium Solution, with its coloured deposit of Lead Meconate.

LOTIO PLUMBI LACTATIS.—Solution of Lead Subacetate, 1 fl. drm.; Salicylic Acid, 2 grains; Milk, to 2 fl. oz.—*Middlesex.*

UNGUENTUM PLUMBI TANNICI. — *Ger.*, Tannic Acid 1, Liquor Plumbi 2, Lard 17.

Hung. and *Swiss*, Tannic Acid 1, Liquor Plumbi 2, Vaseline 17.

Russ., Tannic Acid 1, Glycerin 3, Liquor Plumbi 6, Ung. Cerei 24.

Swed., Tannic Acid 1, Subacetate of Lead Solution 3; Wool Fat 3, Vaseline 3.

PODOPHYLLI RHIZOMA.

PODOPHYLLUM RHIZOME.

B.P.Syn.—PODOPHYLLUM ROOT.

FR., PODOPHYLLE; GER., PODOPHYLLIN; ITAL., PODOFILLO; SPAN., PODOFILO.

The dried Rhizome and Roots of *Podophyllum peltatum*, L. Imported from North America.

The dried Rhizome and Roots of *Podophyllum Emodi*, L., and the **Resin** extracted from the same, dose $\frac{1}{4}$ to 1 grain = 0·016 to 0·06 gramme, are official in in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

The Resin obtained from *P. Emodi* is as valuable a purgative as that obtained from *P. peltatum.*

Medicinal Properties.—The **Resin** is an active cholagogue and, in large doses, purgative; in doses of $\frac{1}{8}$ to $\frac{1}{4}$ grain it is a common ingredient of pills for habitual constipation associated with liver disorder.

Prescribing Notes.—*The Resin is given in pills, combined generally with Extract of Henbane or Belladonna to prevent griping, and associated with a purgative such as Aloes or Colocynth; sometimes $\frac{1}{2}$ grain of Capsicum is added to each pill. In mixtures, the addition of Aromatic Spirit of Ammonia is useful, as in Tinctura Podophylli Ammoniata, since Water does not precipitate the Resin from this, while it does so from the ordinary Tincture.*

Official Preparations.—Podophylli Resina and Tinctura Podophylli.

Not Official.—Of the **Resin** Pilula Podophylli Composita, Pilulæ Aloes et Podophylli Compositæ, Pilulæ Podophyllini et Belladonnæ et Nucis Vomicæ, Pilulæ Aloini et Podophylli Compositæ, Pilulæ Podophylli Belladonnæ et Capsici, Pilules de Podophylline Belladonée, Tinctura Podophylli Ammoniata.

Foreign Pharmacopœias.—Official in Belg., Dutch, Fr., Ital., Port., Span. and U.S. Not in the others.

Descriptive Notes.—Podophyllum Rhizome as met with in commerce occurs in cylindrical pieces, 1 to 6 or 8 in. in length, and 2 to 4 lines in diameter (5 to 8 mm., *B.P.*), of a chocolate or reddish-brown colour; marked on the upper surface, at intervals of 2 or 3 in., with the circular scars of former stems, and on the under surface near the nodes, with little rootlets about half a line thick, which are frequently more or less broken off. If shrunken, wrinkled, and flattened, the Rhizomes are of inferior quality. The fracture is short, normally mealy, but horny if overheated in drying; it exhibits a thin bark, a pith 2 lines in diameter in the larger pieces, and a thin circle of 20–40 vascular bundles. It has an acrid, bitter taste and a characteristic odour.

The Rhizome of *Podophyllum Emodi* has been used as a source of

Podophylli Resina. It is quite different in appearance from that of *Podophyllum peltatum*, consisting of a compressed knotty Rhizome about $\frac{1}{2}$ in. broad (12 mm.), and $\frac{1}{3}$ in. (8 mm.) thick, the upper surface covered with contiguous circular stem scars, the whole under surface having brown or blackish simple roots about $\frac{1}{12}$ to $\frac{1}{8}$ in. (2 to 3 mm.) thick, with short branches.

Tests.—Podophyllum Root contains from 3 to 4 p.c. of ash, and should not contain more than 5 p.c. A standard of not less than 5·0 p.c. of Resin soluble in Alcohol (90 p.c.) has been suggested (*Y.B.P.* '03, 247; *P.J.* '02, ii. 496). American Podophyllum Rhizome may contain from 4 to 6 p.c. of Podophyllum Resin, the Indian Rhizome from 10 to 12 p.c. Seven samples of the root examined (*P.J.* '03, i. 164) yielded percentages of Resin varying from 1·6 to 3·86, an average of 2·19 p.c.

Preparations.

PODOPHYLLI RESINA. PODOPHYLLUM RESIN. *N.O.Syn.*—PODOPHYLLIN.

The Resin is extracted by Alcohol (60 p.c.), the solution concentrated in a still, and the residue poured into acidulated Water to precipitate the Resin, which is washed and finally dried at a temperature not exceeding 100° F. (37·7° C.).

A yellow, greenish-yellow, or yellowish-brown, amorphous powder, or amorphous masses readily reduced to powder. It has a faint, peculiar odour, and a bitter taste.

The variations in colour appear to depend upon the heat applied during its preparation; by distilling quickly and drying at a low temperature the lightest tints are obtained.

It should be kept in well-closed glass receptacles of a dark amber tint in a cool atmosphere and protected as far as possible from contact with the air and light.

The *B.P.* Resin is obtained from the dried Rhizome and Roots of *Podophyllum peltatum*, the Resin obtained from the dried Rhizome and Roots of *Podophyllum Emodi* is official in the *Ind.* and *Col. Add.* The *U.S.P.* and the *P.G.* only admit the Resin obtained from *Podophyllum peltatum.*

Dose.—$\frac{1}{4}$ to 1 grain = 0·016 to 0·06 gramme.

Ph. Ger. maximum single dose, 0·1 gramme; maximum daily dose, 0·3 gramme.

Not Official.—*See* Podophylli Rhizoma.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Ger., Hung., Russ. and Swiss (Podophyllinum); Dutch, Jap., Norw., Port., Swed. and U.S. (Resina Podophylli); U.S. has also a Fluid Extract; Fr. (Resine de Podophylle); Ital. (Podofillina); Mex. and Span. (Podofilina).

Tests.—Podophyllum Resin darkens in colour when heated or when exposed to the light. It is required by the *U.S.P.* to be soluble or nearly so in Alcohol (90 p.c.) and in Ammonia Solution; to be reprecipitated from its solution in Alcohol (90 p.c.) by Water, and from its solution in Ammonia Solution on acidification. It is also officially required to be partly soluble in Ether. It is difficult to find a commercial sample perfectly soluble in cold Alcohol (90 p.c.), and many will not give clear solutions even with the addition of Ammonia; the amount of matter insoluble in Alcohol (90 p.c.) should, however, not exceed 5 p.c. The *U.S.P.* states that not less than 99 p.c. of Resin should be soluble in Alcohol (94·9 p.c.), and this statement appears to be based upon the results of some experiments by Gordin and Merrell recorded (*Proc. Amer. Pharm. Assoc.* '02, 348). Gravell and Sage [*P.J.* (3) xxiv. 421] also state that a good sample should dissolve almost completely in Rectified Spirit, *B.P.* 1885. The *P.G.* states that it is soluble in 10 parts by weight of Alcohol (90 p.c.) to a brown fluid which is precipitated by the addition of Water. A good sample of the *Peltatum* Resin should dissolve almost completely in Ammonia, and not more than 5 p.c. should remain insoluble.

The *Emodi* Resin is stated to gelatinise with Ammonia Solution, the gelatinisation being stated (*C.D.* '03, i. 630) to be due to the fact that *Podophyllum Emodi* contains from 1½ to 3 times as much Podophyllotoxin as the *Podophyllum peltatum.*

Dott (*P.J.* '06, ii. 431; *Proc. Amer. Pharm. Assoc.* '07, 681) gives an Ammonia test for Podophyllin, and he applies the test by treating 0·5 of a gramme of the Resin with 30 c.c. of equal volumes of Liquor Ammoniæ and Water, stirring and bringing well into contact for 5 minutes, filtering the liquor through a counterpoised filter, washing with Water until the washings are practically colourless, drying till constant, then weighing. He finds the *Emodi* Resin remains practically insoluble, whilst the residue from *Peltatum* should not amount to more than 15 p.c. of its original weight. The Report of the Committee of Reference in Pharmacy states that the Committee does not know a satisfactory test to distinguish the *Podophyllum Emodi* from *Podophyllum peltatum.* The solubility in Ammonia Solution is not considered (*P.J.* '02, ii. 368) of much value. The *U.S.P.* does not include a statement relating to its solubility in Ammonia Solution. The *P.G.* states that Podophyllin should dissolve in 100 parts of Ammonia Solution to a yellowish-brown fluid which is miscible with Water, but which is again precipitated as a brown flocculent precipitate on the neutralisation of the Ammonia. The *U.S.P.* states that not less than 75 p.c. should be soluble in Ether, the *P.G.* that it is only partly soluble in Ether. The *U.S.P.* limit of 75 p.c. soluble in Ether seems very high, the usual amount averaging about 60 p.c. The *B.P.* makes no reference to the solubility in Chloroform. The *U.S.P.* requires that not less than 65 p.c. should be soluble in Chloroform. The *P.G.* does not refer to the Chloroform solubility. More than half the weight of the Resin should dissolve in cold Chloroform, the residue being generally reckoned as medicinally inert; if the Chloroform solution be evaporated to a small bulk and poured into an excess of Ether, another inert body (Podophyllic Acid) is precipitated. If the Ether-chloroform Solution be now added to a large excess of Petroleum Ether there is precipitated a compound called Podophyllotoxin, supposed to contain the whole medicinal elements of the Resin.

From the results recorded (*P.J.* '02, ii. 368) of the examination of a number of specimens of the Resin it is concluded that the limit of 50 p.c. soluble in Chloroform given by Squire is a good criterion of the quality of the sample. It is also suggested in the same reference that at least 40 p.c. of of the original Resin should be precipitated from the chloroformic solution by Petroleum Ether. A method of determining the crude Picro-podophyllin has been suggested (*Proc. Amer. Pharm. Assoc.* '02, 346), it consists in treating 5 grammes of Podophyllin Resin, in a strong round bottle holding about 200 c.c., with 10 grammes of freshly prepared Calcium Hydrate, the bottle is closed with a good cork and the whole weighed, it is uncorked, transferred to a water-bath heated to 60° to 65° C. (140° to 149° F.) for a few minutes and 15 c.c. of Alcohol poured in, the bottle stoppered, well shaken, replaced in the water-bath and retained there stoppered for 8 hours, shaking at first every few minutes to prevent the formation of a hard lump; after half an hour it is only necessary to shake the mixture about every quarter of an hour. The bottle is then cooled, about 7 c.c. of Chloroform added, it is placed on the balance and sufficient of a mixture of 2 parts by volume of Alcohol (94·9 p.c.) and 1 part by volume of Chloroform poured into the bottle to make the whole liquid added weigh 130 grammes. The bottle is shaken for a few minutes, set aside until the supernatant liquid becomes perfectly clear, and 65 grammes of the clear liquid are drawn off into a tared vessel, evaporated to dryness, the residue dried till constant in weight, and weighed. The percentage of crude Picro-podophyllin found varied from 15 to 22 p.c., averaging 20 p.c.

The *U.S.P.* states that not more than 25 p.c. should be dissolved in boiling Water. Neither the *B.P.* nor the *P.G.* makes any reference to the Water solubility. The *U.S.P.* also states that the hot aqueous solution deposits most of its content on cooling, and after the cooled liquid be filtered, the filtrate has a bitter taste and yields on the addition of a few drops of Ferric Chloride T.S. a brown coloration. It is soluble in Potassium or Sodium Hydroxide T.S. with the production of a deep yellow liquid which gradually becomes darker on standing. On neutralisation of the Potassium or Sodium Hydroxide the Resin is reprecipitated. The behaviour with Liquor Potassæ is stated to form a useful test for differentiating the *Peltatum* and *Emodi* Resin. 6 grains of the Resin should be mixed with 1 fl. drm. of diluted Alcohol and 8 or 10 drops of Liquor Potassæ. The *Peltatum* Resin should form a clear deep yellow liquid on shaking; the *Emodi* Resin becomes a semi-solid gelatinous mass. The alcoholic solution of the Resin should be only faintly acid in reaction towards blue Litmus paper. It is officially required to yield not more than 1 p.c. of ash when ignited with free access of air. Badly adulterated specimens are frequently detected by high percentage of ash, it may be as low as ½ p.c. and should not exceed 1 p.c. The *U.S.P.* states that it should not yield more than 1 p.c. of ash. The *P.G.* does not give an ash limit. The *B.P.* limit of 1 p.c. is generally considered a suitable one.

TINCTURA PODOPHYLLI.—TINCTURE OF PODOPHYLLUM.
Podophyllum Resin, 320 grains; Alcohol (90 p.c.), *q.s.* to yield 20 fl. oz. of filtered product.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

15 minims equals ½ grain of Podophyllum Resin. It is twice the strength of *B.P.* '85.

A corresponding preparation, **Tinctura Podophylli Indicæ** (1 in 30), dose 5 to 15 minims = 0·3 to 0·9 c.c., is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Tests.—Tincture of Podophyllum has a sp. gr. of 0·840 to 0·850; it contains about 3·5 p.c. of w/v total solids and about 87 p.c. w/v of Absolute Alcohol. A standard of 3·6 p.c. has been suggested.

Not Official.

PILULA PODOPHYLLI COMPOSITA.—Podophyllum Resin, $\frac{1}{12}$ grain; Quinine Sulphate, 1 grain; Alcoholic Extract of Belladonna, ⅙ grain; Extract of Socotrine Aloes, 1 grain.—*University.*

This has been incorporated in the *B.P.C.* under the title Poore's pill.

Podophyllum Resin, ¼ grain; Mercurous Chloride, 1 grain; Alcoholic Extract of Belladonna, ⅙ grain.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

PILULÆ ALOES ET PODOPHYLLI COMPOSITÆ. *Syn.* Janeway's Pills.—Purified Aloes, 1 grain; Resin of Podophyllum, ½ grain; Extract of Belladonna Leaves, ¼ grain; Extract of Nux Vomica, ¼ grain in each pill.—*U.S.N.F.*

Pilulæ Podophyllini et Belladonnæ et Nucis Vomicæ.—Podophyllum Resin, ⅓ grain; Alcoholic Extract of Belladonna, ⅛ grain; Extract of Nux Vomica, ½ grain; Extract of Barbados Aloes, 1 grain in 1 pill.—*B.P.C.*

Pilulæ Aloini et Podophylli Compositæ.—Aloin, 4 grains; Oleo-Resin Capsicum, 2 grains; Jalap Resin, 4 grains; Podophyllum Resin, 6 grains; Extract of Nux Vomica, 2 grains; Green Extract of Hyoscyamus, 2 grains; to make 40 pills.—*B.P.C.*

PILULÆ PODOPHYLLI, BELLADONNÆ ET CAPSICI.—Resin of Podophyllum, 1·6; Extract of Belladonna Leaves, 0·8; Capsicum, 3·2; Sugar of Milk, 6·5; Acacia, 1·6; Glycerin, Syrup, each a sufficient quantity to make 100.—*U.S.P.*

PILULES DE PODOPHYLLINE BELLADONÉES.—Podophyllin, 0·3 gramme; Extract of Belladonna, 0·1 gramme; Medicinal Soap, 0·3 gramme; make into 10 pilules.—*Fr.*

TINCTURA PODOPHYLLI AMMONIATA.—Podophyllum Resin, 24 grains; Alcohol (90 p.c.), 2 fl. oz.; Solution of Ammonia, 1 fl. oz.; dissolve.

Tests.—Ammoniated Tincture of Podophyllin has a sp. gr. of 0·906; contains about 1·5 p.c. w/v of total solids and about 56 p.c. w/v of Absolute Alcohol.

As the Resin does not separate on the addition of Water, this tincture is miscible with Water.

Dose.—10 to 30 minims = 0·6 to 1·8 c.c. 1 fl. drm. contains 1 grain of the Resin.

Podophyllin, 1; Aromatic Spirit of Ammonia, 50; dissolve, and after standing decant.—*Martindale.*

This has been incorporated in the *B.P.C.*

Not Official.

POTASSIUM.

POTASSIUM.

K, eq. 38·83.

Potassium was discovered by Sir Humphry Davy in 1807. It is a soft metal, cutting like Wax, of a silver-white colour, but tarnishes the instant it is cut, and assumes a leaden colour.

Tests.—Potassium has a sp. gr. of 0·865. When freshly cut has a silver-white lustre, but rapidly absorbs Oxygen from the air and assumes a leaden colour. When a pellet is thrown upon Water, Hydrogen is set free, the heat developed during the action being so great that the evolved Hydrogen is ignited. The resulting solution possesses a strongly alkaline reaction towards red Litmus paper. A trace of a Potassium salt, when moistened with Hydrochloric Acid and inserted into a non-luminous flame, imparts to it a distinctive violet coloration, which has a reddish-violet tinge when viewed through blue glass; the yellow colour imparted to the flame by Sodium compound is obscured by blue glass. A solution of a Potassium salt, preferably a Chloride or one in which Hydrochloric Acid is present, affords if sufficiently concentrated a yellow crystalline precipitate with Platinic Chloride Solution, yielding upon ignition a residue of metallic Platinum and Potassium Chloride. If the residue be dissolved in a little Water, acidified slightly with Nitric Acid the solution yields on the addition of Silver Nitrate a white curdy precipitate, insoluble in Nitric Acid, soluble in Ammonia Solution. The aqueous solution, if sufficiently concentrated, yields on the addition of Tartaric Acid a white crystalline precipitate of Potassium Hydrogen Tartrate; Acetic Acid or Sodium Acetate is added when the Potassium is combined with a mineral acid. The best general reagent for Potassium salts is probably a saturated solution of Picric Acid; a 1 p.c. solution of Potassium Nitrate yields a crystalline precipitate after a few seconds' shaking, whereas with Tartaric Acid no reaction is obtainable in 4 hours. Potassium salts may be distinguished from Ammonium salts by the behaviour with Platinic Chloride Solution; the precipitate from a solution of a Potassium salt yielding on ignition, as above stated, a residue of Potassium Chloride and metallic Platinum, a precipitate from an Ammonium salt yielding on ignition a residue of metallic Platinum only. Potassium salts may be distinguished from Sodium salts by the latter not yielding a precipitate with Platinic Chloride Solution, and by the violet colour imparted to the flame by the former, whereas the latter impart a strong yellow colour; also solutions of Sodium salts yield no crystalline precipitate with Tartaric Acid.

The prolonged use of Potassium salts is apt to lead to a depressant effect on muscular tissue, including that of the heart; in people with weakness of that organ this should be borne in mind.

POTASSA CAUSTICA.

POTASSIUM HYDROXIDE.

B.P.Syn.—CAUSTIC POTASH; POTASSIUM HYDRATE.
HYDRATE OF POTASSIUM, *B.P.* '85.

FR., HYDROXYDE DE POTASSIUM OFFICINAL; GER., KALIUMHYDROXYD; ITAL., POTASSA CAUSTICA; SPAN., HIDRATO POTASICO.

White, deliquescent sticks or pencils, or in hard, white, or nearly white, deliquescent cakes, officially stated to consist of Potassium Hydroxide, KOH, eq. 55·71, with not more than 10 p.c. of combined Water and impurities.

On account of its intense causticity and strong action on organic tissues great caution should be used in handling it. As it rapidly absorbs both Carbon

Dioxide and moisture, it should be preserved from the air in well-closed, hard glass bottles.

Commercial Caustic Potash as a rule contains 1 or 2 p.c. of Chloride derived from the Carbonate used in its preparation. When required *pure* it is dissolved in Absolute Alcohol, and the solution evaporated as far as practicable without access of air to avoid absorption of Carbonic Acid. No commercial samples, however, are quite free from Carbonate.

Solubility.—2 in 1 of Water; 1 in 3½ of Alcohol (90 p.c.); 1 in 3 of Glycerin; 1 in 4 of Alcohol (60 p.c.) (if stronger than this the Alcohol separates).

Medicinal Properties.—A powerful caustic. Has been used for the destruction of tumours and to stimulate ulcers.

Prescribing Notes.—*It has a great tendency to diffuse and attack the surrounding tissues; its action should be carefully circumscribed by means of Vaseline or Sticking Plaster. When mixed with Lime, as in 'Vienna Paste' (see p. 931), it is more easily controlled.*

Official Preparation.—Liquor Potassæ; used in the preparation of Potasii Permanganas.

Not Official.—Brandish's Alkaline Solution, and Potassa cum Calce (Vienna Paste).

Foreign Pharmacopœias.—Official in Austr. and Hung. (Kalium Hydro-oxydatum); Belg. (Potassa Caustica Fusa); Dan., Dutch, Norw. and Swed. (Hydras Kalicus); Fr. (Hydroxyde de Potassium Officinal, also Hydroxyde de Potassium Ordinaire); Ger. and Russ. (Kali Causticum Fusum); Ital., (Potassa Caustica); Jap. (Kali Causticum); Mex. (Oxido de Potasio); Port. (Hydrato de Potassa); Span. (Hidrato Potasico), also (Potassa Caustica por la Cal); Swiss (Kalium Hydricum); U.S. (Potasii Hydroxidum).

Tests.—Potassium Hydroxide fuses when strongly heated; the *U.S.P.* states when heated to a temperature of about 530° C. (986° F.). When dissolved in Water and neutralised with Hydrochloric Acid it affords the tests distinctive of Potassium given under that heading. Its aqueous solution possesses a strong alkaline reaction towards red Litmus paper, produces a fine pink tint with Phenolphthalein Solution, and has an alkaline reaction towards Methyl Orange. It is officially required to contain at least 89·7 p.c. of pure Potassium Hydroxide, as determined by titration with Volumetric Sulphuric Acid Solution as indicated below. Few commercial samples approach this figure, although the standard is easy of attainment; the general range found in the author's laboratory is between 78 and 85 p.c. The *U.S.P.* requires that it should contain not less than 85 p.c. of pure anhydrous Potassium Hydroxide, as determined by titration with Normal Volumetric Sulphuric Acid Solution, using, as shown below, Methyl Orange T.S. as an indicator of neutrality. The *P.G.* requires that it shall contain at least 90 p.c. of pure Potassium Hydroxide, as determined by titrating an aliquot portion of a solution containing the molecular equivalent of Potassium Hydroxide with Normal Volumetric Hydrochloric Acid Solution as described below.

The more generally occurring impurities are Arsenic, Copper, Lead, Carbonate, Chloride, Sulphate, and Nitrate. It should not yield any reaction for Arsenic when examined by the modified Gutzeit's test. An aqueous solution slightly acidified with Hydrochloric Acid should not be darkened in colour nor yield a precipitate with Hydrogen Sulphide Solution. No effervescence should occur on the addition of diluted Sulphuric Acid to a 10 p.c. aqueous solution. Commercial Potash as a rule contains 1 or 2 p.c. of Chloride derived from the Carbonate used in its preparation. The presence of Chloride, Sulphate, and Nitrate may be determined by the Silver Nitrate, Barium Nitrate, and Ferrous Sulphate tests described below. In addition to these impurities it may also contain Aluminium, Calcium, and Silica. When neutralised with Hydrochloric Acid it should yield no white flocculent precipitate on the addition of Ammonia Solution, when the solution is boiled. If the liquid be filtered it should yield no distinct turbidity or a precipitate with Ammonium Oxalate Solution; when dissolved in Water, an excess of Hydrochloric Acid added, and evaporated to dryness, the residue should be completely soluble in Water.

Water or Alcohol (90 p.c.).—An aqueous solution (1–20) should be perfectly clear and colourless, *U.S.P.* 1 gramme dissolved in 2 c.c. of Water, then mixed with 10 c.c. of Alcohol, should leave only a very insignificant residue on standing, *P.G.* 1 gramme dissolved in Water or Alcohol should leave only a trace of sediment, *B.P.*

Sulphuric Acid.—10 c.c. of an aqueous solution (1–10) should show no distinct effervescence on the addition of an excess of diluted Sulphuric Acid, *U.S.P.*

Lime Water and Nitric Acid.—If a solution of 1 gramme of Potassium Hydroxide in 10 c.c. of Water be boiled with 15 c.c. of Lime Water and filtered, the filtrate with excess of Nitric Acid added to it should not evolve gas bubbles, *P.G.*

Sulphuric Acid and Ferrous Sulphate.—If 2 c.c. of a solution (1 20) prepared with diluted Sulphuric Acid be mixed with 2 c.c. of Sulphuric Acid, and 1 c.c. of Ferrous Sulphate T.S. poured over it, no coloured zone should appear, *P.G.*

Barium Nitrate.—A solution (1–50) saturated with Nitric Acid should not be immediately affected by T.S. of Barium Nitrate, *P.G.*

Silver Nitrate.—A solution (1–50) saturated with Nitric Acid should not become more than opalescent with T.S. of Silver Nitrate, *P.G.*

Time-limit Test.—An aqueous solution (1–20) slightly acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Volumetric Determination.—16·1 c.c. of Normal Volumetric Sulphuric Acid Solution should be necessary for the neutralisation of a solution of 1 gramme of Caustic Potash in Water or Alcohol (90 p.c.) *B.P.*; 9 c.c. of Normal Volumetric Hydrochloric Acid Solution should be necessary to neutralise 10 c.c. of a solution of 5·6 grammes of Potassium Hydroxide in 100 c.c. of Water, *P.G.*; weigh accurately in a stoppered weighing bottle about 1 gramme of Potassium Hydroxide, dissolve in about 50 c.c. of Water and titrate the solution with Normal Volumetric Sulphuric Acid Solution, using Methyl Orange T.S. as indicator. *U.S.P.*

Preparation.

LIQUOR POTASSÆ. SOLUTION OF POTASH.

A clear, colourless or almost colourless, strongly alkaline solution.

Liquor Potassæ *B.P.* contains 6·19 p.c. w/v of pure Potassium Hydroxide, corresponding to 6·2 grains in 110 minims or 27 grains in 1 fl. oz. The *U.S.P.* Liquor contains about 5 p.c. w/w of Potassium

Hydroxide, corresponding to 5·23 p.c. w/v, about 5¼ grains per 110 minims or 23 grains per fl. oz. The *P.G.* Liquor contains 15 p.c. w/w of pure Potassium Hydroxide, equivalent to 5·23 p.c. w/v, 17·1 grains per 110 minims or 75 grains per fl. oz.

It should be preserved in well-stoppered glass bottles of a dark amber shade, and the stoppers may be smeared with mineral Oil to prevent fixation.

Medicinal Properties.—Caustic. When diluted it is antacid and antilithic. Occasionally employed as an antacid in dyspepsia, accompanied by acidity and gastralgia. It is apt to irritate the stomach, and so, to obtain all the best internal effects of Potash, the Bicarbonate and Citrate are much to be preferred. Externally as an escharotic against the bite of rabid or venomous animals; diluted, it relieves itching.

It acts powerfully on all organic matter, converting flannel into a kind of soft jelly after immersion for 5 or 6 hours.

Dose.—10 to 30 minims = 0·6 to 1·8 c.c., freely diluted.

Incompatibles.—Acids, acid salts, metallic and alkaloidal salts, the preparations of Ammonium, Belladonna, Henbane, and Stramonium.

Antidotes.—Diluted Acetic Acid, Citric Acid, Lemon Juice, or any vegetable acids, fixed oils and demulcents; stimulants; Morphine for pain; neither stomach-tube nor emetics are to be used.

Foreign Pharmacopœias.—Official in U.S., sp. gr. about 1·046 at 25° C. (77° F.) (5 p.c.); Austr. (Kalium Hydroxydatum Solutum), sp. gr. 1·325 to 1·332; Dutch (Solutio Hydratis Kalici), sp. gr. 1·180; Fr. (Hydroxyde de Potassium dissous), sp. gr. 1·080; Ger. (Liquor Kali Caustici), sp. gr. 1·138 to 1·140 (15 p.c.); Russ. (Kali Causticum Solutum), sp. gr. 1·126 to 1·130 (15 p.c.); Swed. (Solutio Hydratis Kalici), sp. gr. 1·225 to 1·235 (25 p.c.); Swiss (Kalium Hydricum Solutum), sp. gr. 1·33. Not in the others.

Tests.—Liquor Potassæ is officially required to have a sp. gr. of 1·058. The *U.S.P.* gravity is 1·046 at 25° C. (77° F.). The *P.G.* 1·138 to 1·140. It possesses a strong alkaline reaction towards blue Litmus paper and towards Phenolphthalein and Methyl Orange Solutions. It answers the tests distinctive of Potassium given under that heading. It is officially required to contain 6·19 p.c. w/v, equivalent to 5·85 p.c. w/w of pure Potassium Hydroxide as volumetrically determined by titration with Volumetric Sulphuric Acid Solution as described below. The *U.S.P.* requires that it shall contain about 5 p.c. w/w, equivalent to 5·23 p.c. w/v of Potassium Hydroxide as volumetrically determined by the process given below, using Methyl Orange Solution as an indicator of neutrality. The *P.G.* requires that it shall contain about 15 p.c. w/w, equivalent to 17·1 p.c. w/v of Potassium Hydroxide, but does not indicate a method by which this requisite percentage can be assured. The Liquor should be free from the more generally occurring impurities mentioned under Potassa Caustica. It is also officially required to be free from Ammonia, Magnesium, Iron or Sodium. Why Potassium Hydroxide should be required to yield no characteristic reaction with the tests for Arsenic, Copper and Lead only, whilst the solution made therefrom should be required not to yield any characteristic reaction with the tests for Aluminium, Ammonium, Arsenic, Calcium, Copper, Iron, Lead, Magnesium and Sodium, as well as to be free from more than traces of Carbonates, Chlorides or Sulphates, is not quite apparent. The *U.S.P.* more consistently remarks that it should conform to the reactions and tests for an aqueous Potassium Hydroxide Solution given under Potassii Hydroxidum. The aqueous solution should not evolve ammoniacal odours when boiled, nor should the issuing vapour have an alkaline reaction towards red Litmus paper. The aqueous solution acidified with Hydrochloric Acid treated with Ammonia in slight excess, and boiled and filtered, treated with Ammonium Oxalate Solution and again filtered, should yield no distinct turbidity nor a precipitate on the addition of Sodium Phosphate Solution. When freshly made, Potassium Hydroxide Solution usually contains a little Lime, but as it absorbs Carbon Dioxide the Lime is thrown out.

Lime Water and Nitric Acid.—The solution, when boiled with 4 parts of Lime Water and filtered, gives a filtrate which does not evolve gas bubbles with excess of Nitric Acid, *P.G.*

Barium Nitrate.—Diluted with 5 parts of Water and supersaturated with Nitric Acid, it should not become more than opalescent with T.S. of Barium Nitrate, *P.G.*

Silver Nitrate.—A similar solution should not become more than opalescent with T.S. of Silver Nitrate, *P.G.*

Sulphuric Acid and Ferrous Sulphate.—If 2 c.c. of Potassium Hydroxide be neutralised with diluted Sulphuric Acid, then mixed with 2 c.c. of Sulphuric Acid and 1 c.c. of Ferrous Sulphate T.S. poured on as a layer, no coloured zone should be produced, *P.G.*

Ammonia.—After supersaturating solution of Potassium Hydroxide with Hydrochloric Acid, it should not become more than opalescent with Ammonia T.S. even after standing, *P.G.*

Volumetric Determination.—10 c.c. of Normal Volumetric Sulphuric Acid Solution neutralises 9 c.c. of Solution of Potash, *B.P.*; 25 c.c. of Normal Volumetric Sulphuric Acid Solution should be necessary to neutralise 28 (27·87) grammes of solution of Potassium Hydroxide, using Methyl Orange T.S. as indicator, *U.S.P.*

Not Official.

BRANDISH'S ALKALINE SOLUTION.—American Pearl-ash, 6 lbs.; freshly prepared Quicklime, 2 lbs.; Wood-ashes, 2 lbs.; boiling Water, 6 gallons: or 6, 2, 2, and 60 parts; add first the Lime, then the Pearl-ash, and lastly the Wood-ashes to the boiling Water, stir well together, let it stand 24 hours and decant the clear liquor.

Dose.—½ to 2 fl. drm. = 1·8 to 7·1 c.c. in Milk. Given for scrofulous conditions.

POTASSA CUM CALCE (Vienna Paste).—Potassium Hydroxide and Calcium Oxide, equal weights; powder and mix; it is made into a paste with Alcohol (90 p.c.).

This has been incorporated in the *B.P.C.*

The paste is spread on the part to be cauterised, and is allowed to remain for 10 to 15 minutes, while the surrounding skin is protected by adhesive plaster. It is also used in the treatment of lupus. It is not so likely to diffuse as Caustic Potash alone.

Foreign Pharmacopœias.—Official in Fr. and Ital., Potassium Hydroxide 5, Lime 6; Mex. (Pasta de Viena), Potassium Hydroxide 1, Lime 1; Span. (Caustico de Viena), Potassium Hydroxide 50, Lime 60.

Potassa cum Calce **in cylinders**, consisting of 2 parts of Potassa and 1 of Lime for the use of gynæcologists.

POTASSA SULPHURATA.

SULPHURATED POTASH.

B.P.Syn.—LIVER OF SULPHUR.

N.O.Syn.—HEPAR SULPHURIS.

FR., SULFURE DE POTASSE; GER., SCHWEFELLEBER; ITAL., SOLFURO DI POTASSIO; SPAN., SULFURO (TRI) POTASICO.

Liver-brown, deliquescent, irregular pieces, which gradually absorb moisture and Carbon Dioxide, the colour changing to greenish-yellow. It has a disagreeable odour of Hydrogen Sulphide when slightly moist, and an alkaline reaction. It is a mixture of various Potassium salts, chiefly Sulphides.

As it is deliquescent and liable to oxidation on exposure to the air it should be kept in well-closed glass bottles of a dark amber tint and protected as far as possible from contact with the air; it should also be kept in a cool atmosphere.

Solubility.—1 in 2 of Water.

Medicinal Properties.—Similar to those of Sulphur, but more energetic. Externally, as a bath or in ointment form, it is a good remedy for scabies and other parasitic cutaneous diseases; used also for chronic eruptions, especially psoriasis and acne. Internally it is occasionally used for chronic rheumatism and chronic skin diseases.

A hot bath of Sulphurated Potash relieves the itching of jaundice.—*L.* '85, ii. 1220.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

Not Official.—Unguentum Potassæ Sulphuratæ, Pommade Sulfureuse, Balneum Sulphuretum, Bain Sulfuré, Bain Sulfuré Liquide.

Foreign Pharmacopœias.—Official in Austr., Ger., Jap., Russ. and Swiss (Kalium Sulfuratum); Austr. and Hung. have (Kalium Sulfuratum pro Balneo); Belg. (Sulphuretum Potassii Officiale); Dan., Norw., and Swed. (Hepar Sulphuris); Dutch (Trisulphuretum Kalicum); Fr. (Sulfure de Potasse); Ital. (Solfuro di Potassio); Mex. (Sulfuro de Potasio); Port. (Potassa Sulfurada); Span. (Sulfuro (tri) Potasico). Not in U.S.

Tests.—Potassium Sulphide dissolves readily in Water, forming a yellow solution possessing an odour of Hydrogen Sulphide and an alkaline reaction towards red Litmus paper. On the addition of an excess of Hydrochloric Acid it evolves the distinctive odour of Hydrogen Sulphide, and the issuing gas produces a black stain on paper moistened with Lead Acetate Solution; a deposit of Sulphur simultaneously appears in the liquid. When freed from Hydrogen Sulphide by boiling until the vapours no longer cause a discoloration of Lead Acetate paper, and filtering, the filtrate yields the tests distinctive of Potassium given under that heading. A portion of the filtrate also yields with Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid. The *B.P.* requires that about 50 p.c. of the substance should be soluble in Alcohol (90 p.c.). When well made it contains from 50 to 60 p.c. of Potassium Sulphide.

Not Official.

UNGUENTUM POTASSÆ SULPHURATÆ.—Sulphurated Potash, 30 grains; Hard Paraffin, ¼ oz.; Soft Paraffin, ¾ oz. This ointment should be freshly prepared.—*B.P.* 1885.

This has been incorporated in the *B.P.C.*

POMMADE SULFUREUSE (*Vet.*). –Sulphurated Potash (powdered very finely), 1; Vaseline, 30. Mix to form a homogeneous pomade.—*Fr.*

BALNEUM SULPHURETUM.—Sulphurated Potash, 4 oz.; Water, 30 gallons; dissolve.

Used in psoriasis, etc.

This is not quite so agreeable as the Barèges waters, which may be made artificially as follows:—Sodium Sulphide, Sodium Carbonate, and Sodium Chloride, of each 20 grains to 1 gallon. But a much stronger solution is often used.

BAIN SULFURÉ.—100 grammes of Sulphurated Potash (broken up) are placed in well-closed bottle. When required for use, it is dissolved in a litre of warm water and the solution is poured into the water-bath. The bath should be non-metallic or made of zinc.—*Fr.*

BAIN SULFURÉ LIQUIDE.—Sulphurated Potash, 1; Water, 2. Dissolve, filter and preserve in a well-closed bottle to be added to a bath when required.—*Fr.*

POTASSII ACETAS.

POTASSIUM ACETATE.

$KC_2H_3O_2$, eq. 97·41.

Fr., Acetate de Potassium; Ger., Kaliumacetat; Ital., Acetato di Potassio; Span., Acetato Potasico.

White, almost odourless, deliquescent crystals, or crystalline satin-like masses, or as a white, deliquescent, coarse granular powder.

It should be kept in well-closed vessels and protected as far as possible from contact with the air.

It may be prepared by neutralising Potassium Carbonate with Acetic Acid, evaporating and fusing the product. It has been stated that the formula given in the *B.P.* does not represent the substance actually in use, which cannot be rendered anhydrous on a technical scale without decomposition. An allowance of 10 p.c. of Water on drying at 110° C. (230° F.) would be reasonable.

Solubility.—2 in 1 of Water; 1 in 2 of Alcohol (90 p.c.).

Medicinal Properties.—Used as a diuretic in dropsy, chiefly renal, and in febrile diseases; as an antilithic in gout and the uric acid diathesis; valuable in sub-acute rheumatism.

Dose.—10 to 60 grains = 0·65 to 4 grammes.

Prescribing Notes.—*Best administered in simple solution, with a little Syrup if necessary.*

Foreign Pharmacopœias.—Official in all except Austr., Ger., Jap. and Swiss; Austr., contains a *solution*, sp. gr. 1·200; Ger., Hung., Ital., Jap. and Russ. have also a solution, sp. gr. 1·176 to 1·180 (about 33 p.c.); Swiss has Liquor, sp. gr. 1·17 to 1·18.

Tests.—Potassium Acetate fuses when strongly heated, the *U.S.P.* states at a temperature of 292° C. (557·6° F.). At a still higher temperature it chars, and when ignited it should leave a white residue completely soluble in Water. The salt dissolves readily in Water, forming a clear solution which is alkaline in reaction towards red Litmus paper, but which does not produce a pink coloration with Phenolphthalein Solution. It yields the tests distinctive of Potassium given under that heading. The aqueous solution when mixed with Sulphuric Acid and boiled evolves a distinctive acetous odour. When warmed with Sulphuric Acid and a few drops of Alcohol (90 p.c.) a distinctive odour of Ethyl Acetate is evolved. An aqueous solution yields with Ferric Chloride T.S. a deep red coloration, and on boiling a brown flocculent precipitate is thrown out. The *B.P.* does not require it to contain any definite percentage of pure Potassium Acetate, nor is a method given by which it can be assayed. The *U.S.P.* requires that it should contain when thoroughly dry not less than 98 p.c. of pure Potassium Acetate as volumetrically determined by titration of the solution of the residue left on ignition with Seminormal Volumetric Sulphuric Acid Solution as indicated below, using Methyl Orange Solution as an indicator of neutrality.

The more generally occurring impurities are Aluminium, Arsenic, Calcium, Copper, Iron, Lead and Magnesium; the *B.P.* requiring that the usual 'no characteristic reaction' should be yielded with the tests for these impurities, and also for Carbonates or Sulphides. Chlorides and Sulphates may also be present; the official directions are that only the slightest reactions with the tests for these substances shall be yielded. Arsenic, if present, may be detected by the alliaceous odour evolved during the cautious ignition of the sample. It may also be determined by the Hydrogen Sulphide test given below, and by the Gutzeit's test also described below. Copper, Iron and Lead, if present, may be recognised by the Hydrogen Sulphide test either in acid or alkaline solution. No flocculent precipitate nor a turbidity should be produced by the addition of Ammonia Solution on boiling. The filtrate should not yield a turbidity nor a precipitate with Ammonium Oxalate Solution. If the liquid be again filtered, the filtrate should neither yield a turbidity nor a precipitate with Sodium Phosphate Solution. Chlorides and Sulphates, if present, are indicated by Silver Nitrate and Barium Chloride Solutions.

Time-limit Test.—An aqueous solution (1–20) slightly acidulated with Acetic Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Gutzeit's Test.—5 c.c. of an aqueous solution of the salt (1–10) should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Volumetric Determination.—Thoroughly carbonise 1 gramme of dry Potassium Acetate at a temperature not exceeding red heat, extract the residue with boiling Distilled Water until the washings cease to react with Methyl Orange T.S. The mixed filtrate and washings should require for complete neutralisation not less than 20·1 c.c. of Semi-normal Volumetric Sulphuric Acid Solution, using Methyl Orange Solution as indicator, *U.S.P.*

Not Official.

POTASSII BENZOAS.

$KC_7H_5O_2\ 3H_2O$, eq. 212·60.

A white crystalline powder; soluble 1 in 1¼ of Water; 1 in 18 of Alcohol (90 p.c.). Useful in cystitis of gouty or rheumatic origin.

It should be kept in well-stoppered glass bottles and in a cool atmosphere.

Dose.—15 to 20 grains = 1 to 1·3 grammes.

Tests.—Potassium Benzoate dissolves readily in Water, yielding a solution which is slightly alkaline in reaction towards red Litmus paper, and which affords, if sufficiently concentrated, on the addition of diluted Sulphuric Acid Solution, a copious white crystalline precipitate. If this precipitate be separated, washed and carefully dried, it should possess the m.p. and answer the tests distinctive of Benzoic Acid given under Acidum Benzoicum. The filtrate from the precipitate yields the tests distinctive of Potassium given under that heading. An aqueous solution of the salt affords with Ferric Chloride T.S. a buff coloured precipitate. The percentage of pure Potassium Benzoate may be determined by dissolving 1 gramme in Water, adding sufficient Ether to dissolve the Benzoic Acid and titrating with Tenth-normal Volumetric Hydrochloric Acid Solution, using Methyl Orange Solution as an indicator of neutrality. 1 c.c. of Tenth-normal Volumetric Hydrochloric Acid Solution corresponds to 0·02126 gramme of pure Potassium Benzoate.

It may also be assayed by igniting the Benzoate and titrating the filtered solution of the residual Potassium Carbonate with Tenth-normal Volumetric Hydrochloric Acid Solution, using Methyl Orange Solution as an indicator of neutrality.

POTASSII BICARBONAS.

POTASSIUM BICARBONATE.

B.P.Syn.—POTASSIUM HYDROGEN CARBONATE.

$KHCO_3$, eq. 99·38.

FR., CARBONATE ACIDE DE POTASSIUM; GER., KALIUMBICARBONAT;
ITAL., BICARBONATO DI POTASSIO; SPAN., BICARBONATO POTASICO.

Colourless, transparent, monoclinic prisms, or as a white crystalline powder, odourless and having a saline and slightly alkaline taste. It is permanent in the air.

It may be obtained by saturating a strong aqueous Potassium Carbonate solution with Carbonic Anhydride.

It should be kept in well-closed vessels and in a cool atmosphere.

Solubility.—1 in 3·2 of Water. Insoluble in Alcohol (90 p.c.).

Medicinal Properties.—Antacid, antilithic, and diuretic. Used in dyspepsia as an antacid, and in gout to increase the alkalinity of the blood and excretion of urates; in the acute or inflammatory stage of gonorrhœa there is no better remedy, as it renders the urine alkaline and unirritating. In bronchitis and pneumonia it renders the secretion less tenacious; in influenza it has been given with success. *See also* Sodium Bicarbonate, which is generally preferred in dyspepsia.

20 grains are prescribed in effervescence with 15 grains of Citric Acid.

Closely resembles the Carbonate, but without its irritant qualities.

Potassium salts delay the conversion of gelatinous Sodium Biurate into the crystalline variety, and when the conversion is once started it is slowed by the presence by these salts. Potassium salts exercise most influence.—*L.* '00, i. 931.

Given in the treatment of gleet in order to artificially produce phosphaturia. —*L.* '08, i. 424.

Dose.—5 to 30 grains = 0·32 to 2 grammes.

Foreign Pharmacopœias.—Official in U.S.; Belg. (Bicarbonas Potassæ); Fr. (Carbonate Acide de Potassium); Norw. and Swed. (Bicarbonas Kalicus); Ger., Jap., Russ. and Swiss (Kalium Bicarbonicum); Mex. (Carbonato de Potasio acido); Port. (Bicarbonato de Potassa); Span. (Bicarbonato Potasico). Not in Austr., Dan., Dutch, Hung., or Ital.

20 parts by weight of Potassium Bicarbonate are neutralised by 14 parts of Citric Acid, and by 15 parts of Tartaric Acid.

Tests.—Potassium Bicarbonate loses Carbonic Anhydride when exposed to a temperature of about 100° C. (212° F.) and at a dull red heat is completely converted into Potassium Carbonate. It dissolves in Water, forming a clear solution which is alkaline in reaction towards red Litmus paper, but neutral in reaction towards Phenolphthalein Solution. It answers the tests distinctive of Potassium given under that heading, it dissolves with effervescence in diluted Sulphuric Acid, the evolved gas yielding, when passed into Lime Water, a white precipitate soluble in a sufficient excess of gas. It is officially required to contain 99·4 p.c. of pure Potassium Bicarbonate as determined, first, gravimetrically by the weight of residue left on ignition, and, secondly, volumetrically by the titration of that residue with Volumetric Sulphuric Acid Solution as described below. The *U.S.P.* requires that it shall contain not less than 99 p.c. of pure Potassium Bicarbonate as volumetrically determined by direct titration with Semi-normal Volumetric Sulphuric Acid Solution, Methyl Orange T.S. being employed as an indicator of neutrality. The *P.G.* requires that it shall contain 100 p.c. of pure Potassium Bicarbonate, first, as volumetrically determined by direct titration with Normal Volumetric Hydrochloric Acid Solution, secondly, as gravimetrically determined by the weight of residue left on ignition. Both the *U.S.P.* volumetric determination method and the volumetric and gravimetric methods of the *P.G.* are described in the small type below.

The more generally occurring impurities are Arsenic, Calcium, Copper, Iron and Lead; Carbonates, Chlorides, Nitrates and Sulphates. The *B.P.* requires that in addition to these it shall yield no characteristic reaction with the tests for Aluminium, Magnesium and Sodium and Sulphides. Arsenic, if present, may be detected by the modified Gutzeit's test using the Hydrochloric Acid solution of the salt, and also by the Hydrogen Sulphide test described below, which also detects, if present, Copper and Lead. A standard has been suggested (*C.D.* '08, i. 796) of 5 parts per million for Lead and 2 parts per million for Arsenic, and for Chlorides a standard of 0·1 p.c. calculated as KCl. The *P.G.* includes a separate test for Iron with Potassium Ferrocyanide, see below. Calcium, if present, may be detected by a turbidity or precipitate produced on adding Ammonium Oxalate Solution to an aqueous solution of the salt rendered slightly acid with Acetic Acid. Magnesium, if present, may be detected in the filtrate from the Ammonium Oxalate Solution. Aluminium and Sodium are unlikely impurities. Chlorides and Sulphates, if present, may be detected by the Barium Nitrate and Silver Nitrate test described below. Nitrates may be detected by the Ferrous Sulphate and Sulphuric Acid test. The *U.S.P.* uses the Phenolphthalein test described below to detect the presence of Carbonate.

Phenolphthalein.—A concentrated aqueous solution is neutral to T.S. of Phenolphthalein, *U.S.P.* Dissolve 1 gramme of the salt without agitation in 20 c.c. of Water at a temperature not above 15° C. (59° F.), add 0·2 c.c. of Normal Volumetric Hydrochloric Acid Solution and 2 drops of Phenolphthalein T.S. A red tint should not appear immediately, *U.S.P.*

Barium Nitrate.—An aqueous solution (1-20) after saturation with Acetic Acid should not be affected by T.S. of Barium Nitrate, *P.G.*

Silver Nitrate.—A solution as above, after the addition of Nitric Acid, should not become more than opalescent with T.S. of Silver Nitrate, *P.G.*

Hydrogen Sulphide.—An aqueous solution (1–20) after saturation with Acetic Acid should not be affected by T.S. of Hydrogen Sulphide, *P.G.*; a (1–20) aqueous solution slightly acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Potassium Ferrocyanide.—20 c.c. of an aqueous solution (1–20) saturated with Hydrochloric Acid should not become blue with 0·5 c.c. of T.S. of Potassium Ferrocyanide, *P.G.*

Gravimetric Determination.—1 gramme when heated at a low red heat leaves 0·69 gramme of a white residue, *B.P.*; 100 parts by weight of the salt when ignited to a dull red heat shall leave 69 parts by weight of residue, *P.G.*

Volumetric Determination.—The 0·69 gramme of white residue obtained by igniting 1 gramme of the salt at a dull red heat shall require 10 c.c. of Volumetric Sulphuric Acid Solution for neutralisation, *B.P.* 1 gramme should require for neutralisation 10 c.c. of Normal Volumetric Solution of Hydrochloric Acid, *P.G.* 1 gramme should require for neutralisation not less than 19·9 c.c. of Semi-normal Volumetric Solution of Sulphuric Acid, using Methyl Orange as indicator, *U.S.P.*

POTASSII BICHROMAS.

POTASSIUM BICHROMATE.

B.P.Syn.—POTASSIUM DICHROMATE; RED CHROMATE OF POTASSIUM.

$K_2Cr_2O_7$, eq. 292·30.

FR., CHROMATE ACIDE DE POTASSIUM; GER., KALIUMDICHROMAT; ITAL., BICROMATO DI POTASSIO; SPAN., BICROMATO POTASICO.

Large, orange-red, odourless, translucent, prismatic crystals, having a bitter taste. Permanent in the air.

It should be kept in well-stoppered glass bottles of a dark amber tint in a cool place.

Solubility.—1 in 10 of Water; 5 in 6 of boiling Water.

Medicinal Properties.—A powerful irritant poison in over-doses, rarely used in medicine, but extensively in the arts.

Highly recommended by Fraser in dyspepsia and gastric ulcer (*L.* '94, i. 923), and by Bradbury.—*L.* '95, ii. 671.

Dose.—$\frac{1}{10}$ to $\frac{1}{5}$ of a grain = 0·006 to 0·013 gramme, in pills with 'Massa Kaolin.'

Official Preparation.—Used in the preparation of Acidum Chromicum.

Antidotes.—Stomach-tube or emetics, Magnesium Carbonate or Chalk, albuminous and demulcent drinks.

Foreign Pharmacopœias.—Official in Fr., Ger., Port., Russ., Span., Swed., Swiss and U.S. Not in the others.

Tests.—Potassium Bichromate fuses below a red heat, and at a considerably higher temperature is decomposed, evolving Oxygen and leaving a residue of neutral yellow Chromate and green Chromium Oxide. The salt dissolves in Water with the formation of a reddish-yellow solution, which has a slightly acid reaction towards blue Litmus paper. When warmed with Sulphuric Acid and Ethylic Alcohol the yellow aqueous solution assumes a green colour, at the same time evolving a distinctive odour of Acetaldehyde. The experiment requires to be carefully conducted, as the reaction is very energetic. An aqueous solution yields, with Barium Chloride, a reddish precipitate soluble in Hydrochloric Acid. With Silver Nitrate Solution it yields a dark purple-red precipitate soluble in Nitric Acid and in Ammonia Solution. If sufficient Barium Chloride Solution or Silver Nitrate Solution be added to an aqueous solution of the salt to precipitate the whole of the Chromium as Chromate, the filtrate from these precipitates answers the test distinctive of Potassium given under that heading. It is officially required to contain 99·8 p.c. of pure Potassium Bichromate as volumetrically determined by the process described in the small type below. The *U.S.P.* requires that it should contain not less than 99 p.c. of pure Potassium Bichromate, but does not give a method of determination by which this requisite percentage may be assured. The *P.G.* gives neither a percentage nor a method of determination.

The more generally occurring impurities are Calcium, Chlorides and Sulphates. Chlorides and Sulphates, if present, may be detected by the Barium Chloride and Silver Nitrate tests in acid solution; Calcium, if present, by the Ammonium Oxalate test described below.

Barium Chloride or Nitrate.—The yellowish-white precipitate obtained on adding Barium Chloride T.S. to an aqueous solution of the salt should be entirely soluble in diluted Nitric Acid, *B.P.*; the *P.G.* states that an aqueous solution (1–100) strongly acidulated with Nitric Acid and warmed should not be affected by Barium Nitrate T.S.

Silver Nitrate.—The purplish-red precipitate obtained on adding Silver Nitrate to an aqueous solution of the salt should be entirely soluble in Nitric Acid, *B.P.*; the *P.G.* states that an aqueous solution as in the previous test should not be affected by T.S. of Silver Nitrate.

Ammonium Oxalate.—An aqueous solution (1–100) of the salt after the addition of Ammonia T.S. should not become turbid with T.S. of Ammonium Oxalate, *P.G.*

Volumetric Determination.—To effect the oxidation of the Iron from the Ferrous to the Ferric condition a solution of 5·66 grammes of Ferrous Sulphate in Water acidulated with Sulphuric Acid should require the addition of a solution containing 1 gramme of Potassium Bichromate, *B.P.*

POTASSII BROMIDUM.

POTASSIUM BROMIDE.

N.O.Syn.—BROMURETUM KALICI.

KBr, eq. 118·18.

FR., BROMURE DE POTASSIUM; GER., KALIUMBROMID; ITAL., BROMURO DI POTASSIO; SPAN., BROMURO POTASICO.

Colourless or white, odourless, cubical crystals, possessing a strong, characteristic, saline taste. They are permanent in the air.

It should be kept in well-closed bottles and protected as far as possible from the light.

Solubility.—10 in 17 of Water, and measures 20; 1 in 1 of boiling Water; 1 in 95 of Alcohol (90 p.c.); 1 in 17 of boiling Alcohol (90 p.c.).

Medicinal Properties.—Sedative, hypnotic, anaphrodisiac. Very successful in epilepsy, in hysteria, and in convulsions generally. Used in insomnia, due not to pain but to worry or overwork or the climacteric, sea-sickness and the sickness of pregnancy, also in nervous head-ache, nightmare and the night-screaming of children, in migraine and in neuralgia. Useful in spermatorrhœa and nymphomania, and with chloral in delirium tremens. Relieves in some cases of whooping-cough and spasmodic asthma, both in children and adults. In enormous doses sometimes successful in tetanus.

Bromides still the most potent agents for the treatment of idiopathic epilepsy. No special advantage noticed in giving the mixed Potassium, Sodium and Ammonium Bromides. Potassium salt usually given, but when it appears to cause undue depression, the Ammonium or Sodium salt is substituted. In nocturnal epilepsy, a single dose should be given an hour before bed-time, and two hours before an attack is due when the fits recur about the same time in the day. As a rule, better to increase the single dose than to give the same amount in divided doses several times a day.—*L.* '03, i. 440; *B.M.J.* '03, i. 371.

Bromide rash treated by use of arsenical waters, milk diet and a poultice containing Boric Acid applied locally.—*T.G.* '99, 593.

On its use combined with Sodium Salicylate in headache.—(Brunton) *Pr.* lii. 101.

By combining it with Arsenic in small doses, the unpleasant effects known as 'Bromism' may be prevented or reduced.

Butter-milk as a local application to the acne-like eruption produced by administration of Bromides.—*L.* '02, ii. 1724.

Dose.—5 to 30 grains = 0·32 to 2 grammes.

Incompatibles.—Any oxidising agents are liable to set free the Bromine; Spiritus Ætheris Nitrosi.

Official Preparation.—Used in the preparation of Acidum Hydrobromicum Dilutum.

Not Official.—Sal Bromatum Effervescens.

Foreign Pharmacopœias.—Official in Austr., Ger., Hung., Jap., Russ. and Swiss (Kalium Bromatum); Belg. (Bromuretum Potassii); Dan., Dutch, Norw. and Swed. (Brometum Kalicum); Fr. (Bromure de Potassium); Ital. (Bromuro di Potassio); Mex. (Bromuro de Potasio); Port. (Brometo de Potassio); Span. (Bromuro Potasico); U.S. (Potassii Bromidum).

Tests.—Potassium Bromide when heated decrepitates, and when strongly heated fuses. It dissolves readily in Water, forming a clear solution which should be neutral in reaction towards Litmus paper. It answers the tests distinctive of Potassium given under that heading. The aqueous solution, when treated with a little Chlorine Water, assumes a brown or reddish-brown coloration, and when shaken with Chloroform the colour passes into the chloroformic solution. On the addition of Silver Nitrate Solution the aqueous solution affords a yellowish, curdy precipitate, practically insoluble in Ammonia Solution, insoluble in Nitric Acid, readily soluble in Potassium Cyanide Solution. A small quantity of the salt heated with Manganese Dioxide and Sulphuric Acid evolves the characteristic irritating vapours of Bromine, which communicates an orange-yellow colour to filter paper soaked in Starch Mucilage. It is officially required to yield not less than 98·9 p.c. nor more than 100·9 p.c. of pure Potassium Bromide as volumetrically determined by direct titration of the salt with Volumetric Silver Nitrate Solution as indicated below. The *U.S.P.* requires that it should contain not less than 97 p.c. of pure Potassium Bromide as volumetrically determined by direct titration of the well-dried salt with Tenth-normal Volumetric Silver Nitrate Solution as described below, using Potassium Chromate Solution as an indicator. The *P.G.* requires that it shall contain not more than 100·8 p.c. of pure Potassium Bromide as determined by titrating an aliquot portion of a solution of 3 grammes of the salt dried at 100° C. (212° F.) dissolved in 100 c.c. of Water, as described in small type below, using Potassium Chromate Solution as an indicator. If the figures required by the official Silver Nitrate titration be calculated into KBr they would indicate a percentage of 98·91 to 100·92. As 100 p.c. KBr requires 84·62 c.c.; the excess over the theoretical figure would be due to KCl, which may be present from 0·1 p.c. to 6 p.c. This cannot give a definite Chloride figure unless all impurities unaffected by Silver Nitrate are known to be absent; the only interfering impurity, however, which may be expected to be present is Water, so that if *B.P.* had directed the dried salt to be used for titration, the percentage of Chloride might be arrived at by subtracting 84·62 from the number of c.c. used and dividing the result by 0·5. Some English samples of the salt contain less than ¼ p.c. of Chloride, but some American samples contain nearly 6 p.c.

The more generally occurring impurities are Arsenic, Copper, Iron, Lead and Zinc, Barium and Calcium, Bromates, Iodides and Iodates, Chlorides and Sulphates. In addition to the usual official statement that it should yield 'no characteristic reaction' for the tests for Aluminium, or only the slightest reaction with the tests for these substances, the *B.P.* also includes similar requirements with regard to Ammonium, Magnesium, Sodium, and gives a specific and definite test for absence of Thiocyanates. Arsenic, if present, may be detected by the Gutzeit's test. It may also, together with Copper, Iron, Lead and Zinc, if present, be detected by the Hydrogen Sulphide test described below; Arsenic, Copper and Lead in slightly acid solution; Iron and Zinc in alkaline solution. Barium, if present, may be detected by the Potassium Sulphate test described below. Calcium, if present, by the addition of Ammonium Oxalate to the aqueous solution slightly acidified with Acetic Acid. Bromates, if present, may be detected by the Sulphuric Acid test given below. The Barium Nitrate test serves to detect Sulphates if present. The Chlorine Water and Chloroform test described below serves to detect the presence of Iodides. Any excessive proportion of Chloride may be detected by the increase in the titration figure as indicated above. The *P.G.* includes a separate test for Iron with Potassium Ferrocyanide Solution. The *U.S.P.* includes a test for limit of alkali, which is given under the Phenolphthalein test in small type below.

The *B.P.* requires that the cold aqueous solution should not assume a red coloration on the addition of Ferric Chloride T.S. It has been suggested (*P.J.* '01, i. 460) that this Thiocyanate test requires modification, the colour produced by Ferric Chloride in an aqueous solution of Potassium Bromide largely depending on the quantity of Potassium Bromide present, the colour being masked by an excess of Potassium Bromide. The modification proposed is that 2 drops of Ferric Chloride T.S. should give a yellow, and not a red or reddish-brown, coloration when added to a solution of 0·1 gramme of Potassium Bromide dissolved in 10 c.c. of Water. The test is stated to indicate the absence of more than 0·1 p.c. of Ammonium Thiocyanate.

Litmus.—An aqueous solution (1–20) is neutral or has only a scarcely perceptible reaction on Litmus, *U.S.P.* Powdered Potassium Bromide should not immediately colour moistened red Litmus paper violet-blue, *P.G.*

Phenolphthalein.—A solution of 1 gramme of the salt in 10 c.c. of Water with 0·1 c.c. Tenth-normal Volumetric Sulphuric Acid Solution added should not give any coloration on the subsequent addition of a drop of T.S. of Phenolphthalein, *U.S.P.*

Diluted Sulphuric Acid.—Crushed Potassium Bromide spread out on white porcelain should not immediately turn yellow on the addition of diluted Sulphuric Acid, *P.G.* Such a mixture, when shaken with 1 c.c. of Chloroform, should not impart to the latter a yellowish-brown colour, *U.S.P.*

Hydrogen Sulphide.—An aqueous solution (1–20) of the salt should not be affected by T.S. of Hydrogen Sulphide, *P.G.* A solution of similar strength acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Barium Nitrate.—An aqueous solution of the salt (1–20) should not be affected by T.S. of Barium Nitrate, *P.G.*

Potassium Sulphate or Diluted Sulphuric Acid.—An aqueous solution of the salt (1–20) should not be affected by diluted Sulphuric Acid, *P.G.*; 10 c.c. of an aqueous solution (1–20) acidulated with Hydrochloric Acid should not be rendered turbid by the addition of 1 c.c. of T.S. of Potassium Sulphate, *U.S.P.*

Potassium Ferrocyanide.—20 c.c. of an aqueous solution (1–20) should not be rendered blue by 0·5 c.c. of T.S. of Potassium Ferrocyanide, *P.G.*

Diluted Chlorine Water and Chloroform.—Add 1 c.c. of Chloroform to 10 c.c. of an aqueous solution of the salt (1–20) and then introduce cautiously drop by drop with constant agitation a mixture of equal volumes of Chlorine Water and Water. The liberated Bromine will dissolve in the Chloroform, imparting to it a yellow to orange colour free from any violet tint, *U.S.P.*

Volumetric Determination.—A solution of 1 gramme of the salt in Water should require for complete precipitation not less than 83·7 nor more than 85·4 c.c. of Volumetric Solution of Silver Nitrate, *B.P.*; 10 c.c. of an aqueous solution (3 grammes in 100 c.c.) of Potassium Bromide which has been dried at 100° C. (212° F.) should after the addition of a few drops of Potassium Chromate T.S. require not more than 25·4 c.c. of Tenth-normal Volumetric Solution of Silver Nitrate to produce a permanent reddening, *P.G.*; 0·3 gramme of the well dried salt dissolved in about 50 c.c. of Water and 2 or 3 drops of Potassium Chromate T.S. added should require not less than 24·6 c.c. nor more than 25·85 c.c. of Tenth-normal Silver Nitrate Volumetric Solution to produce a permanent red colour, *U.S.P.*

Not Official.

SAL BROMATUM EFFERVESCENS.—An effervescent preparation containing about 8 of Potassium Bromide, 8 of Sodium Bromide and 4 of Ammonium Bromide in 60.

CALCIUM BROMIDE.—A white, very deliquescent salt, readily soluble in Water and Alcohol (90 p.c.), which has been introduced as a substitute for Potassium Bromide, but which is not much prescribed.

Dose.—15 to 30 grains = 1 to 2 grammes.

Official in U.S.

POTASSII CARBONAS.

POTASSIUM CARBONATE.

B.P.Syn.—Salt of Tartar.

Fr., Carbonate Neutre de Potassium; Ger., Kaliumcarbonat;
Ital., Carbonato di Potassio; Span., Carbonato Potasico.

A white, deliquescent, crystalline, or granular powder, K_2CO_3, eq. 137·21, officially stated to be associated with either 1 or 2 molecules of Water. It is present in the ashes of plants.

Should be preserved in well-closed bottles.

The *B.P.* Carbonate is associated with either 1 or 2 molecules of Water of crystallisation. The *U.S.P.* Carbonate is required to contain when thoroughly dry not less than 98 p.c. of pure Potassium Carbonate. The *P.G.* requires it to contain at least 95 p.c. of pure Potassium Carbonate.

It has been stated that the article as met with in commerce is not a definite crystalline compound with 1 or 2 molecules of Water, but a mixture containing about 16 p.c. of combined Water. Six samples obtained from leading manufacturers examined in the author's laboratory lost from 16·4 to 19·8 p.c. after exposure to a red heat, the loss averaged 17·4 p.c. The percentage of Chloride present varied between 0·052 and 0·3 p.c., with an average of 0·123 p.c.

Solubility.—4 in 3 of Water, and measures 4½. Insoluble in Absolute Alcohol.

Medicinal Properties.—Similar to those of the Bicarbonate, but rarely used internally on account of its irritant properties. Externally it is used as a lotion in eczema and urticaria.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Official Preparations.—Contained in Decoctum Aloes Compositum, Liquor Arsenicalis, Mistura Ferri Composita, Unguentum Potassii Iodidi. Used in the preparation of Iodoform, Liquor Bismuthi et Ammonii Citratis, Potassa Caustica, Potassa Sulphurata, Potassii Acetas, Potassii Bicarbonas, Potassii Citras and Potassii Tartras.

Foreign Pharmacopœias.—Official in all; Austr., Belg., Ger., Hung., Jap. and Russ. (Kalium Carbonicum); Dan., Dutch, Norw. and Swed. (Carbonas Kalicus); Fr. (Carbonate Neutre de Potassium); Ital. (Carbonato di Potassio); Mex. (Carbonato de Potasio Neutro); Port. (Carbonato de Potassa); Span. (Carbonato Potasico); Swiss has (Kalium Carbonicum Depuratum) and (Kalium Carbonicum Purum); U.S. (Potassii Carbonas); Austr., Dutch, Ger., Jap., Russ. and Swed., include a **crude** Carbonate; Ger., a 33⅓ p.c. Liquor; Swed., a solution, 20 p.c.

Tests.—Potassium Carbonate, *B.P.*, when heated at a red heat loses from 15·0 to 17·0 p.c., and leaves between 83·0 to 85·0 p.c. of anhydrous Potassium Carbonate. The *U.S.P.* states that when heated to 130° C. (266° F.) the salt loses all the Water which it may have retained or absorbed. It dissolves readily in Water, forming a clear solution which has a strong alkaline reaction towards red Litmus paper, which, when neutralised with Hydrochloric Acid, yields the tests distinctive of Potassium given under that heading, and which, on the addition of diluted acids, effervesces, evolving a colourless and odourless gas, which, when passed into Lime Water, yields a white precipitate soluble in a sufficient excess of the gas and redissolving with effervescence in diluted acids. It is officially required to contain 81·6 p.c. of pure Potassium Carbonate as determined volumetrically by direct titration with Volumetric Sulphuric Acid Solution as indicated below. The *U.S.P.* requires that it shall contain not less than 98 p.c. of pure Potassium Carbonate as volumetrically determined by direct titration, using Methyl Orange T.S. as an indicator of neutrality; the process is given below. The *P.G.* requires that it shall contain at least 95 p.c. of pure Potassium Carbonate as volumetrically determined by direct titration as given below.

The more generally occurring impurities are Arsenic, Calcium, Copper, Iron, Lead and Zinc, Aluminium and Magnesium, Chlorides, Nitrates and Sulphates. The *B.P.* also includes Sodium, Cyanides, Sulphides and Thiosulphates. When acidified with Hydrochloric Acid the aqueous solution should yield no reaction with the modified Gutzeit's test. It should yield no reaction with the Hydrogen Sulphide test described below. It should give no flocculent precipitate nor a turbidity when made slightly alkaline with Ammonia Solution and boiled, indicating the absence of Aluminium. The filtrate from this treatment should neither yield a marked turbidity nor a precipitate with Ammonium Oxalate Solution, indicating the absence of more than traces of Calcium. If this liquid be again filtered it should neither yield a pronounced turbidity nor a precipitate with Sodium Phosphate Solution, indicating the absence of more than traces of Magnesium. The aqueous solution, when acidified with Nitric Acid, should yield only a slight turbidity with Silver Nitrate Solution, indicating the absence of more than traces of Chlorides. It should answer the tests for freedom from Nitrate with Ferrous Sulphate and Sulphuric Acid given below; and also the test with Barium Nitrate Solution. When moistened with Hydrochloric Acid and inserted on a platinum loop into a non-luminous flame it should communicate to the flame at most but a transient yellow coloration. On the addition of Sulphuric Acid in slight excess it should not evolve an odour of Hydrocyanic Acid, nor should the issuing gas cause a piece of filter paper moistened with Lead Acetate Solution to darken in colour when suspended in the gas, indicating the absence of Sulphides. Neither should the issuing gas possess an odour of Sulphur Dioxide nor bleach a piece of blue Litmus paper suspended therein; the liquid, after the addition of slight excess of Hydrochloric Acid, should remain clear, indicating the absence of Thiosulphate. The *U.S.P.* gives a test for earthy impurities, requiring that no residue should remain when 1 gramme of the salt is dissolved in 20 c.c. of Water.

Hydrogen Sulphide.—An aqueous solution (1-20) should not be affected by T.S. of Hydrogen Sulphide, either before or after acidification with Acetic Acid, *P.G.*; an aqueous solution (1-20) slightly acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Silver Nitrate.—1 volume of a (1-20) aqueous solution should give with 10 volumes of Tenth-normal Volumetric Silver Nitrate Solution a yellowish-white precipitate, which on gently warming does not become darker in colour, *P.G.*; a (1-20) aqueous solution saturated with diluted Nitric Acid should not be rendered more than opalescent after 2 minutes by T.S. of Silver Nitrate, *P.G.*

Barium Nitrate.—An aqueous solution (1-20) saturated with Acetic Acid should not be affected by T.S. of Barium Nitrate, *P.G.*

Potassium Ferrocyanide.—20 c.c. of an aqueous solution (1-20) over-neutralised with Hydrochloric Acid should not be rendered blue by 0·5 c.c. of T.S. of Potassium Ferrocyanide, *P.G.*

Ferrous Sulphate and Ferric Chloride.—The 1-20 aqueous solution of the salt when mixed and gently warmed with a little Ferrous Sulphate T.S. and Ferric Chloride T.S. should not develop a blue colour on the addition of an excess of Hydrochloric Acid, *P.G.*; indicating the absence of Cyanide.

Ferrous Sulphate and Sulphuric Acid.—2 c.c. of a solution of the salt in diluted Sulphuric Acid mixed with 2 c.c. of Sulphuric Acid and 1 c.c. of Ferrous Sulphate T.S. poured upon it as a layer should not give any coloured zone, *P.G.*; 3 c.c. of Ferrous Sulphate T.S. carefully poured upon 5 c.c. of a cold aqueous (1-20) solution of the salt mixed with 5 c.c. of Sulphuric Acid should not develop a brown colour at the junction of the two liquids, *U.S.P.*

Volumetric Determination.—Not less than 11·9 c.c. of Volumetric Sulphuric Acid Solution should be necessary to neutralise 1 gramme of the salt, *B.P.*; 1 gramme of the salt should require for neutralisation not less than 13·7 c.c. of Normal Volumetric Solution of Hydrochloric Acid, *P.G.*; 1 gramme of the salt thoroughly dried at 130° C. (266° F.) dissolved in 50 c.c. of Water should require not less than 14·3 (14·28) of Normal Sulphuric Acid Volumetric Solution for neutralisation, using Methyl Orange T.S. as indicator, *U.S.P.*

POTASSII CHLORAS.

POTASSIUM CHLORATE.

$KClO_3$, eq. 121·66.

Fr., Chlorate de Potassium; Ger., Kaliumchlorat; Ital., Clorato di Potassio; Span., Clorato Potasico.

Colourless, glistening, translucent, monoclinic prisms or plates, or as a white, odourless powder, possessing a cooling saline taste. It should be kept in well-stoppered bottles.

On account of the ready manner in which it evolves Oxygen, it should be handled with caution, great care being taken to avoid friction or any sudden percussion when mixing it with readily oxidisable or inflammable substances. When triturated with certain substances, *e.g.*, Sulphur, Sugar, Tannic Acid and Antimony Sulphide, it forms explosive mixtures. It has also been known to explode whilst being compressed into tablets.

Solubility.—1 in 16 of cold Water; 1 in 2 of boiling Water; 1 in 1700 of Alcohol (90 p.c.); 1 in 152 of Alcohol (60 p.c.).

Medicinal Properties.—A local stimulant. A strong solution, 1 or 2 in 40 of Water, is the best **wash** for the mouth when the gums are spongy, inflamed and irritable, and for ulcerative stomatitis; it relieves the tenderness and induces a firmness of the gums; it is also an excellent **gargle** in tonsillitis. The powder is applied to aphthæ in the mouth. Internally it is given to prevent the tendency to miscarriage, and to fœtal death. In young people it should be used with great care and in small doses, if given at all.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

10 grains 3 times daily for 6 months with no ill effects, in habitual death of the fœtus in the later months of pregnancy.—*L.* '02, ii. 459.

Hyperplasia of the fœtal thyroid in cases where the mother had been given Potassium Chlorate.—*B.M.J.* '03 i. 657, 874.

As a galactagogue, *T.G* '93, 322; internally 7 drm. taken by mistake caused death.—*L.* '79, i. 206.

40 to 60 grains each of this salt and Carbolic Acid in 8 oz. of Water will be found a pleasant and efficacious solution with which to brush the teeth and wash out the mouth and throat as a preliminary treatment in neurasthenia. —*B.M.J.* '06, i. 493.

Incompatibles.—Charcoal, Sulphur and Ferrous salts. Hydrochloric Acid causes the evolution of Chlorine; other mineral acids, of various chlorous-smelling oxy-compounds; organic acids the same but much more slowly.

Official Preparation.—Trochiscus Potassii Chloratis; used in the preparation of Potassii Permanganas.

Not Official.—Gargarisma Potassii Chloratis, Gargarisme au Chlorate de Potassium, Mistura Potassii Chloratis, Pulvis Potassii Chloratis Compositus and Sodii Chloras.

Foreign Pharmacopœias.—Official in Austr., Belg., Ger., Hung., Jap., Russ. and Swiss (Kalicum Chloricum); Dan., Dutch, Norw. and Swed. (Chloras Kalicus); Fr. (Chlorate de Potassium); Ital. (Clorato di Potassio); Mex. (Clorato de Potasio); Port. (Chlorato de Potassa); Span. (Clorato Potasico); U.S.

Tests.—Potassium Chlorate fuses when strongly heated, evolving a colourless and odourless gas; if the glowing end of a splinter of wood be inserted into the containing vessel it immediately ignites. When heated till no further gas is evolved it leaves a white residue, and if this residue be dissolved in Water a solution is yielded which, on the addition of Silver Nitrate Solution, affords a white precipitate, insoluble in Nitric Acid, readily soluble in Ammonia Solution and in Potassium Cyanide Solution. The aqueous solution of this residue also affords the tests distinctive of Potassium given under that heading. The *U.S.P.* states that it fuses at 334° C. (633·2° F.) and decomposes above 352° C. (665·6° F.), the whole of the Oxygen being evolved above 400° C. (752° F.). It also states that the amount of residue left amounts to 60·8 p.c. of the pure Chlorate employed. The salt, when treated with Hydrochloric Acid and warmed, evolves a yellow gas possessing a strong chlorinous odour and stated by the *B.P.* to be a mixture of Chlorine and Chloric Oxide. It dissolves in Water, the resulting solution having a neutral reaction towards Litmus paper.

The more generally occurring impurities are Aluminium, Calcium, Copper, Iron, Lead, Magnesium and Sodium, Chlorides, Nitrates and Sulphates. The aqueous solution should neither yield a turbidity nor a flocculent precipitate when boiled with Ammonia Solution. An aqueous solution of the salt should yield neither a turbidity nor a precipitate with Ammonium Oxalate Solution. It should not be affected by the Hydrogen Sulphide or Ammonium Sulphide test described below. A standard has been suggested (*C.D.* '08, i. 796) of 10 parts per million for Lead and 2 parts per million for Arsenic. If the liquid, to which Ammonium Oxalate Solution is added, be filtered it should yield neither a turbidity nor a precipitate on the addition of Sodium Phosphate Solution. A crystal of the salt when moistened with Hydrochloric Acid and inserted into a non-luminous flame on a loop of platinum wire should not afford a distinct or permanent yellow coloration to the flame. The aqueous solution should not afford more than a faint turbidity on the addition of Silver Nitrate or Barium Chloride Solution. It is officially required to yield no characteristic reaction with the tests for Nitrates; but in this instance the usual tests for Nitrates, unless carried out with considerable modification, are of no avail. In testing for Nitrates the *U.S.P.* employs Potassium Hydroxide T.S. and Aluminium wire. The *P.G.* employs a solution of Sodium Hydroxide with a mixture of Zinc filings and powdered Iron as described below.

Hydrogen Sulphide or Ammonium Sulphide.—An aqueous solution of the salt (1-20) should not be affected by T.S. of Hydrogen Sulphide, *P.G.*; should not become discoloured by T.S. of Ammonium Sulphide, *U.S.P.*

Ammonium Oxalate.—An aqueous solution of the salt (1-20) should not be affected by T.S. of Ammonium Oxalate, *P.G.*

Barium Nitrate.—An aqueous solution of the salt (1-20) should not be affected by T.S. of Barium Nitrate, *P.G.*

Silver Nitrate.—An aqueous solution of the salt (1-20) should not be affected by T.S. of Silver Nitrate, *P.G.*

Potassium Ferrocyanide.—20 c.c. of an aqueous solution of the salt (1-20) should not be rendered blue by T.S. of Potassium Ferrocyanide, *P.G.*

Sodium Hydroxide, Zinc and Iron Filings.—1 gramme of Potassium Chlorate warmed with 5 c.c. Sodium Hydroxide T.S. and a mixture of 0·5 gramme of Zinc filings and powdered Iron should not evolve Ammonia, *P.G.*

Potassium Hydroxide and Aluminium Wire.—If to 1 gramme of the salt contained in a test-tube of about 40 c.c. capacity, 5 c.c. of Water, 5 c.c. of Potassium Hydroxide T.S., and about 0·2 gramme of Aluminium wire be added, and if in the upper portion of the test-tube a pledget of purified cotton be inserted, and over the mouth there be placed a piece of moistened red Litmus paper, then if the tube be heated upon a water-bath for 15 minutes, no blue coloration of the paper should be discernible, *U.S.P.*

Preparation.

TROCHISCUS POTASSII CHLORATIS. Potassium Chlorate Lozenge.

3 grains of Potassium Chlorate in each, with Rose Basis.

Dose.—1 to 6 lozenges.

Potassium Chlorate is supplied in **tablets** or **compressed discs,** also combined with Borax and with Cocaine.

Foreign Pharmacopœias.—Official in Belg. (Tabellæ), $1\frac{1}{2}$ grains; Dutch, $1\frac{1}{2}$ grains; Fr. (Tablettes), $1\frac{1}{2}$ grains; Ital. (Pastiglia), $1\frac{1}{2}$ grains; Jap. (Pastilli), $1\frac{1}{2}$ grains; Mex. (Pastillas), $1\frac{1}{2}$ grains; Port. (Pastilhas), $1\frac{1}{2}$ grains; Span. (Tabletas), $1\frac{1}{2}$ grains; Swiss (Pastilli), $1\frac{1}{2}$ grains; U.S., about $2\frac{1}{4}$ grains in each lozenge.

Not Official.

GARGARISMA POTASSII CHLORATIS.—Potassium Chlorate, 1 drm.; Glycerin, $\frac{1}{2}$ fl. oz.; Water, to 6 fl. oz.

Potassium Chlorate, 200 grains; Diluted Hydrochloric Acid, 100 minims; Water, to 20 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.* as follows:—Potassium Chlorate, 2; Diluted Hydrochloric Acid, 1; Water, to produce 100.—*B.P.C.*

See also Gargarisma Chlori, p. 371.

GARGARISME AU CHLORATE DE POTASSIUM.—Potassium Chlorate, 1; Distilled Water, 25; Syrup of Mulberries, 5; all by weight.—*Fr.*

MISTURA POTASSII CHLORATIS.—Potassium Chlorate, 10 grains; Diluted Hydrochloric Acid, 5 minims; Distilled Water, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

PULVIS POTASSII CHLORATIS COMPOSITUS. — Potassium Chlorate, 1; Borax, 1; Sodium Bicarbonate, 1; White Sugar, 2; all in powder. Mix. A measured teaspoonful to be dissolved in half a tumbler (5 fl. oz.) of tepid Water; half the solution to be injected with a syringe along the floor of each nostril night and morning. After use blow nose freely.—*Central Throat.*

SODII CHLORAS.—Colourless, translucent crystals, or a white crystalline powder. Soluble in about its own weight of Water, and in 5 times its weight of Glycerin.

The same remarks with regard to caution in its use apply to this as to the Potassium salt.

Official in Fr., Mex., Span. and U.S.

POTASSII CITRAS.

POTASSIUM CITRATE.

$K_3C_6H_5O_7 \cdot H_2O$, eq. 321·99.

Fr., Potion Gazeuse; Ger., River'scher Trank; Ital., Citrato di Potassio; Span., Citrato Potasico.

Translucent, prismatic crystals, or as a white, granular, deliquescent powder, possessing a cooling saline taste. It should be preserved in well-stoppered bottles.

The *B.P.* formula for this salt omits the molecule of Water of crystallisation. The *U.S.P.* gives the formula with 1 molecule of Water. The salt is not official in the *P.G.*

Solubility.—10 in 6 of Water, and measures 11; 1 in 2 of Glycerin; 1 in 9 of Alcohol (60 p.c.), but if more of the salt is added the Alcohol separates from the watery solution.

Medicinal Properties.—Antacid, mild diaphoretic and diuretic, also alkalises the urine, and its free administration in acute nephritis is strongly advocated by Fothergill and others. Useful in gout and rheumatism, and in bronchitis with viscid, scanty expectoration. Given as a drink in scurvy.

Free administration combined with Colchicum in the treatment of gout.—*L.* '99, ii. 1362.

Milder cases of bacterial cystitis, pyelitis, and incontinence of urine in children do well with full doses of this combined with sedatives of the Belladonna group.—*L.* '08, i. 79.

In 45-grain doses in diabetic acetonuria, because it is not neutralised by the gastric juice and becomes Bicarbonate in the blood.—*Pr.* '07, ii. 120.

Dose.—10 to 40 grains = 0·65 to 2·6 grammes.

Not Official.—Mistura Potassii Citras Effervescens.

Foreign Pharmacopœias.—Official in Port. and U.S. U.S. has also Potassii Citras Effervescens. Not in the others.

Various solutions of Potassium Citrate occur as follows: Belg., Dutch, Hung. and Russ. (Potio Riverii), Fr. (Potion Gazeuse), Ger. (Potio Riveri made with Sodium Carbonate and Citric Acid), Dan. and Norw. (Julapium Salinum), Port. (Soluto de Citrato de Potassa), Swiss (Potio Effervescens), U.S. (Liquor Potassæ Citratis).

Tests.—Potassium Citrate when heated above 100° C. (212° F.) loses Water, and at 200° C. (392° F.), according to the *U.S.P.*, the Water of crystallisation is completely lost, the loss amounting to 5·55 p.c. When heated to a still higher temparature it chars, and when ignited to a dull red heat leaves a mixture of Potassium Carbonate and Carbon. It dissolves very readily in Water, forming a solution which has an alkaline reaction towards red Litmus paper, but is neutral to Phenolphthalein Solution. The aqueous solution, when acidified with Hydrochloric Acid, yields the tests of Potassium given under that heading. It yields when boiled with an excess of Calcium Chloride Solution a white precipitate insoluble in Potassium Hydroxide Solution, but soluble in Ammonium Chloride Solution and in solutions of alkali Citrates; it yields with Silver Nitrate Solution a white precipitate soluble in Ammonia Solution, but in contradistinction to the precipitate yielded by Tartrates does not yield a mirror when the ammoniacal solution is warmed. It is officially required to contain at least 98·3 p.c. of Potassium Citrate of the pharmacopœial formula, as volumetrically determined by titrating the solution of the residue left on ignition with Volumetric Sulphuric Acid Solution as shown below. It has been found that the volumetric requirements do not correspond to the formula given, and should be altered. The *U.S.P.* requires that it should contain not less that 99 p.c. of pure Potassium Citrate as volumetrically determined by titrating the solution of the residue left on ignition with Semi-normal Volumetric Hydrochloric Acid Solution, using Methyl Orange T.S. as an indicator of neutrality. The method is given in small type below.

The more generally occurring impurities are Calcium, Iron, Lead, Magnesium and Sodium, Carbonates and Tartrates, Chlorides and Sulphates. The aqueous solution should afford no reaction with the Hydrogen Sulphide test described below. A standard has been suggested (*C.D.* '08, i. 796) of 5 parts per million for Lead and 1 part per million for Arsenic. It should afford neither a turbidity nor a precipitate with Ammonium Oxalate Solution, and the filtrate from the Ammonium Oxalate should afford neither a turbidity nor a precipitate with Sodium Phosphate Solution. A crystal of the salt when moistened with Hydrochloric Acid and brought into the non-luminous flame on a loop of platinum wire should at the most afford only a transient yellow coloration to the flame. The addition of diluted Hydrochloric Acid Solution should not cause effervescence in the concentrated aqueous solution. It should yield no reaction with the Acetic Acid test described below. The aqueous solution when acidified with diluted Nitric Acid should yield at the most a faint turbidity on the addition of Silver Nitrate or Barium Chloride Solution.

Hydrogen Sulphide.—An aqueous solution of the salt (1·20) slightly acidulated with Acetic Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Acetic Acid.—1 gramme of the salt dissolved in 1 c.c. of Water should not deposit any precipitate on the addition of 1 c.c. of Acetic Acid, indicating absence of Tartrate, *U.S.P.*

Volumetric Determination.—The filtered aqueous solution obtained by dissolving and filtering the residue left on igniting 1 gramme of dry salt at a red heat, should require for neutralisation not less than 9·7 c.c. of Volumetric Solution of Sulphuric Acid, *B.P.* If 1 gramme of the salt be treated as described under Potassium Acetate it should require for neutralisation not less than 18·4 c.c. of Semi-normal Volumetric Hydrochloric Acid Solution, using Methyl Orange T.S. as indicator, *U.S.P.*

Not Official.

MISTURA POTASSII CITRAS EFFERVESCENS.—Potassium Bicarbonate, 20 grains; Water, to 1 fl. oz. (Alkaline Solution). Citric Acid, 15 grains; Water, to ½ fl. oz. (Acid Solution). Mix the two solutions and drink during effervescence.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

Not Official.

POTASSII CYANIDUM.

KCN, eq. 64·68.

FR., CYANURE DE POTASSIUM; GER., KALIUMCYANID; ITAL., CIANURO DI POTASSIO; SPAN., CIANURO POTASICO.

White, opaque, deliquescent masses, or as a white, granular, deliquescent powder, having the odour of Hydrocyanic Acid. The pure salt can be obtained in white cubical crystals. It is intensely poisonous.

It should be kept in well-stoppered bottles.

The commercial salt containing at least 90 p.c. of Potassium Cyanide is official in the Appendix to the *B.P.*

Solubility.—1 in 2½ of Water; almost entirely 1 in 100 of Alcohol (90 p.c.).

Ordinary fused Cyanide only contains about 40 p.c. of real Cyanide, but there is no difficulty in obtaining it from 95 to 99 p.c.

It is useful to remove the black stains on the skin caused by Silver Nitrate.
Entomologists use it with gypsum to make poison bottles for killing insects without injuring their delicate structure; for this purpose dissolve 1 of the Cyanide in 1½ of Water, and add 2 of Plaster of Paris. This mixture stirred and poured whilst liquid into a wide-mouthed bottle, forms a hard floor, which is constantly giving off vapour.

Foreign Pharmacopœias.—Official in Fr., Mex., Port., Span. and U.S. Not in the others.

Tests.—Potassium Cyanide fuses at a low red heat; it dissolves readily in Water, forming a clear solution which has a strongly alkaline reaction towards red Litmus paper. When treated with a slight excess of diluted Hydrochloric Acid it evolves a highly poisonous and characteristic odour of Hydrocyanic Acid; the resulting solution affords the tests characteristic of Potassium given under that heading. The aqueous solution yields with Silver Nitrate T.S. a white, curdy precipitate soluble in excess of Potassium Cyanide Solution, in Solution of Ammonia and in concentrated Nitric Acid. When shaken with a few drops of a mixture of Ferrous Sulphate T.S. and Ferric Chloride T.S. it yields, on the addition of a slight excess of Hydrochloric Acid, a blue precipitate. No method of determination is given in the *B.P.* The *U.S.P.* requires that it shall yield not less than 95 p.c. of pure Potassium Cyanide as volumetrically determined by dissolving 1 gramme of the salt in sufficient Water to measure 100 c.c., mixing 64·7 c.c. of this solution with 5 c.c. of Ammonia and 3 drops of 20 p.c. w/v Potassium Iodide Solution and titrating the mixture with Tenth-normal Volumetric Silver Nitrate Solution, not less than 47·5 c.c. should be required to produce a permanent precipitate. 1 c.c. of Tenth-normal Volumetric Silver Nitrate Solution is equivalent to 2 p.c. of pure Potassium Cyanide.
The more generally occurring impurities are Carbonate, Ferrocyanide and Sulphocyanide. The addition of diluted Hydrochloric Acid in slight excess to a 5 p.c. solution of the salt should not yield more than a slight effervescence, and the addition of 1 drop of Ferric Chloride T.S. to this liquid should neither produce a blue nor a red coloration.

Not Official.

POTASSII FERROCYANIDUM.

Syn.—Yellow Prussiate of Potash.

$K_4FeC_6N_6$, $3H_2O$, eq. 419·66.

Large, translucent, lemon-yellow, soft, table-shaped crystals or groups of crystals. Slightly efflorescent in dry air.
It is officially described as a yellow crystalline salt prepared by fusing together Potassium Carbonate, nitrogenous organic matter and Iron.
It should be kept in well-stoppered glass bottles of a dark amber tint and exposed as little as possible to the air.

Solubility.—1 in 4 of Water; insoluble in Alcohol (90 p.c.).

Foreign Pharmacopœias.—Official in Mex., Port., Span. and U.S. Not in the others.

Tests.—Potassium Ferrocyanide loses its Water of crystallisation when heated, and is converted into an anhydrous salt at a temperature of 100° C. (212° F.), it dissolves readily in Water, forming a clear solution which is neutral in reaction towards Litmus paper. A concentrated solution yields with Sodium Bitartrate Solution a white crystalline precipitate. Lead Acetate Solution, Zinc Sulphate Solution and Silver Nitrate Solution yield white precipitates. Copper Sulphate Solution yields a reddish-brown precipitate; Ferric Chloride T.S. produces a dark blue precipitate. It may contain Carbonate or Ferricyanide. A concentrated solution of the salt should yield no effervescence on the addition of diluted Sulphuric Acid. The addition of Silver Nitrate Solution to an aqueous solution acidified with Nitric Acid should yield a white precipitate free from a red tint.

Not Official.

POTASSII HYPOPHOSPHIS.

Potassium Hypophosphite.

KPH_2O_2, eq. 103·39.

White, opaque crystals, or in crystalline masses, or as a white, granular deliquescent powder, possessing a pungent and saline taste.

It should be kept in well-closed glass bottles in a cool atmosphere and protected as far as possible from contact with the air, as it is very deliquescent. It should be handled with great caution, as it is readily oxidised, and when brought into contact with substances which readily part with Oxygen the temperature rises so rapidly that an explosion often results.

Solubility.—10 in 6 of Water, 1 in 7 of Alcohol (90 p.c.), 3 in 1 of boiling Water; 1 in 375 of Ether; insoluble in Chloroform.

Tests.—Potassium Hypophosphite when heated in a dry tube loses moisture, and when more strongly heated evolves spontaneously inflammable Hydrogen Phosphide gas, which burns with a bright yellow flame. It dissolves readily in Water, yielding a clear solution which is neutral towards Litmus paper, or only faintly alkaline towards red Litmus paper. It yields the tests distinctive of Potassium given under that heading. The diluted aqueous solution slightly acidulated with diluted Sulphuric Acid yields, on the addition of Silver Nitrate Solution, a white precipitate rapidly becoming brown or black, owing to its reduction to metallic Silver. The aqueous solution when gently warmed with Copper Sulphate Solution yields a reddish-brown precipitate. The aqueous solution of the salt, when acidulated with Hydrochloric Acid and added drop by drop to an excess of Mercuric Chloride Solution, yields a white precipitate of Mercurous Chloride, and on the further addition of an excess of the solution of the salt the white precipitate becomes grey, owing to its reduction to metallic Mercury. Its aqueous solution readily reduces Potassium Permanganate, the purple colour of a Permanganate Solution being rapidly discharged. It is required by the *U.S.P.* to contain not less than 98 p.c. of pure Potassium Hypophosphite, but no method of determination is given. The percentage of absolute Potassium Hypophosphite present may be readily ascertained by the method given under Calcii Hypophosphis.

The more generally occurring impurities are Arsenic, Copper, Lead, Iron and Zinc, Calcium, Chlorides and Sulphates, Phosphates and Phosphites. Arsenic, if present, may be detected by the modified Gutzeit's test, treating 5 c.c. of a 10 p.c. aqueous solution of the salt with 3 c.c. of Nitric Acid diluted with about 10 c.c. of water, evaporating the mixture to dryness on the water-bath, and performing the test on the residue. Copper, Lead, Iron and Zinc, if present, may be detected by Hydrogen Sulphide, either in a solution rendered faintly acid with Hydrochloric Acid, or in a solution made alkaline with Ammonia Solution. The aqueous solution of the salt should not afford a distinct turbidity with Ammonium Oxalate Solution after the addition of a little Ammonium Chloride Solution, indicating the absence of Calcium. If the mixture be allowed to stand for some time and filtered, it should yield little or no turbidity with Sodium Phosphate Solution, indicating the absence of Magnesium. When acidified with diluted Nitric Acid the aqueous solution should not afford a pronounced turbidity or precipitate with either Silver Nitrate Solution or Barium Chloride Solution, indicating the absence of more than traces of Chlorides and Sulphates. It should not yield a very pronounced turbidity or precipitate on the addition of Lead Acetate Solution, indicating a limit of Phosphates and Phosphites. Remarks on the Lead Acetate test will be found under Calcii Hypophosphis and under Sodii Hypophosphis. A 5 p.c. aqueous solution of the salt should not effervesce on the addition of an acid, indicating the absence of Carbonate.

POTASSII IODIDUM.

POTASSIUM IODIDE.

KI, eq. 164·73.

Fr., Iodure de Potassium; Ger., Kaliumjodid; Ital., Joduro di Potassio; Span., Yoduro Potasico.

Colourless translucent, or white opaque, cubical crystals, permanent in dry air. It has a characteristic saline, subsequently somewhat bitter, metallic taste, and a faintly alkaline reaction.

It should be preserved from air and light in well-stoppered bottles and kept in a cool place.

Solubility.—4 in 3 of Water, and measures 4; 1 in 10 of Alcohol (90 p.c.); 1 in 3 of Glycerin.

Medicinal Properties.—Alterative, diuretic, expectorant. It is useful in cases where Iodine is indicated, and being less irritating is much preferred for internal administration. Useful especially in secondary and in tertiary syphilis and in all diseases associated with syphilis, such for example as locomotor ataxy. For secondary symptoms 60 grains in solution may be given in the 24 hours. It reduces chronic inflammatory swellings, effusions and glandular enlargements, and is useful in goître and obesity; also in chronic Bright's disease, bronchitis and bronchitic asthma, aortic disease, endocarditis, internal aneurism, angina pectoris (the pain of which it also relieves), and in established arterio-sclerosis; chronic rheumatism and gout; lumbago, sciatica, psoriasis and, in large doses (*see* below), actinomycosis. May be given with Quinine dissolved by Sulphuric or Phosphoric Acid, but not with Nitro-hydrochloric Acid, as the eliminated Chlorine decomposes it and makes an unsightly mixture. Combined with Nux Vomica the system bears it better. It is useful in the elimination of Lead in cases of chronic lead poisoning; also in treating chronic mercurial poisoning. *See* also under 'Iodum.'

(*B.M.J.* '04, ii. 1063) its efficacious use in rheumatism which was frequently the cause of ovarian pain. Its use in actinomycosis yields little improvement under a dose of less than 20 grains thrice daily (*L.* '04, ii. 1225); and in some instances 1-drm. doses thrice daily have been recommended, but these should be given with large quantities of Water. Sodium Iodide is preferable on account of depression caused by the Potassium salt. It has been recommended (*B.M.J.* '04, ii. 1206) in the internal treatment of non-suppurative middle-ear disease. In large doses (*B.M.J.* '04, ii. 1209), to check the ossifying process in the early stages of oto-sclerosis.

Should always be given in solution well diluted, and if possible never on an empty stomach. Milk is the best diluent. The drug should never be given in phthisis.—*B.M.J.E.* '05, ii. 15.

Where rigid arteries were a cause of insomnia the use of massage and the administration of this salt were of especial value.—*B.M.J.* '05, ii. 249.

The best routine treatment for ordinary cases of Yaws (framboesia), in large doses.—*L.* '07, ii. 1459.

In cretinism.—*L.* '93, ii. 1545.

Sodium or Potassium Iodide when given to man by the stomach in ordinary doses has no depressing effect on the action of the heart, or on the blood pressure in the arteries.—*B.M.J.* '01, ii. 1524.

The opinion is expressed that Iodides are of no value in the treatment of aneurism, and that they are even hurtful in arterio-sclerosis, but the great bulk of medical opinion and experience is directly contrary to this.—*B.M.J.* '01, ii. 1522.

Productive of good results when arterio-sclerosis is established, but absolutely contra-indicated in the pre-sclerosis stage.—*B.M.J.E.* '07, i. 83.

Its regular use in small doses, with the occasional exhibition of Strophanthus, often gives considerable relief in cardio-arterial disease.—*B.M.J.* '01, ii. 1057.

60 to 80 grains 3 times daily, successful in thoracic aneurisms.—*L.* '03, ii. 528.

Good results from its prolonged administration combined with one of the guaiacol preparations in acute rheumatoid arthritis.—*B.M.J.* '01, ii. 1039.

Cases where congenital goitre followed the administration of Potassium Iodide to the mother during pregnancy.—*L.* '07, i. 1714.

Case of Iodine rash after administration of 3 doses of 10 grains each.—*L.* '04. i. 421.

Dose.—5 to 20 grains = 0·32 to 1·3 grammes; this dose is often greatly exceeded, especially in syphilis of the nervous system.

Prescribing Notes.—*Best given with Tincture of Orange and Spirit of Chloroform, in Water, or with Tincture of Cinchona. It is also given with Fowler's Solution to prevent the rash sometimes produced. Tablets cause gastric pain. Solutions of Ferric salts, when acid, set free Iodine from Potassium Iodide.*

It is better borne when given with Potassium Acetate, or when administered alternately with Ferrous Iodide.—*L.* '88, i. 1019.

Incompatibles.—Spiritus Ætheris Nitrosi, Bismuthi Subnitras.

Official Preparations.—Linimentum Potassii Iodidi cum Sapone and Unguentum Potassii Iodidi; contained in Liquor Iodi Fortis, Tinctura Iodi and Unguentum Iodi. Used in the preparation of Hydrargyri Iodidum Rubrum and Plumbi Iodidum.

Not Official.—Linimentum Potassii Iodidi, Linimentum Potassii Iodidi cum Sapone (*B.P.* '67), Mistura Potassii Iodidi, Mistura Potassii Iodidi Alkalina, Mistura Potassii Iodidi et Stramonii, Pilulæ Kalii Iodati, Pomada de Yoduro Potasico con Extracto de Cicuta.

Foreign Pharmacopœias.—Official in Austr., Belg., Ger., Hung., Jap., Russ. and Swiss, (Kalium Iodatum); Dan., Dutch, Norw. and Swed., (Iodetum Kalicum); Fr., (Iodure de Potassium); Ital., (Ioduro di Potassio); Mex., (Yoduro de Potasio); Port., (Iodeto de Potassio); Span., (Yoduro Potasico); U.S.

Tests.—Potassium Iodide when heated decrepitates, and when strongly heated fuses. It dissolves readily in Water, forming a clear solution which possesses a faintly alkaline reaction towards red Litmus paper, and which yields the tests distinctive of Potassium given under that substance. It produces with Silver Nitrate Solution a yellow, curdy precipitate insoluble in Nitric Acid, insoluble in Ammonia Solution, but soluble in Potassium Cyanide Solution. With Mercuric Chloride Solution it yields a brilliant scarlet precipitate slightly soluble in excess of the reagent and readily soluble in the Iodide Solution. With Lead Acetate it yields a yellow crystalline precipitate soluble in diluted Nitric Acid and also in boiling Water; it is deposited, as the solution cools, in brilliant golden crystalline scales. When cautiously mixed with a little Chlorine Water or Bromine Solution it yields a brown or reddish-brown coloration, and on the addition of Starch Mucilage an intense blue colour; if the brown coloured solution be shaken with Carbon Bisulphide, the Bisulphide Solution assumes a deep violet colour. It is officially required to contain not less than 98·0 p.c. nor more than 101·9 p.c. of pure Potassium Iodide as volumetrically determined by direct titration of the salt with Volumetric Silver Nitrate Solution. The *U.S.P.* requires that the salt should contain at least 99·0 p.c. of pure Potassium Iodide as volumetrically determined by the direct titration of a solution of a well-dried salt in Water as indicated below. The *P.G.* does not give a requisite percentage of pure Potassium Iodide nor a method of determination.

The more generally occurring impurities are Arsenic, Aluminium, Calcium, Copper, Iron, Lead, Magnesium and Sodium, Bromates and Bromides, Carbonates, Chlorides, Cyanides, Iodates, Nitrates or Sulphates. The *B.P.* requires that it shall yield only the slightest reactions with the tests for Bromides, Carbonates, Chlorides or Sulphates, and no characteristic reaction for the remaining substances. The *U.S.P.* includes a test for limit of alkali, 'less soluble salts,' Barium and Thiosulphates. Arsenic, Copper, Lead and Iron may be detected, if present, by the Hydrogen Sulphide test described below, either before or after the addition of Ammonia. Neither a turbidity nor a flocculent precipitate should be produced when an aqueous solution of the salt is boiled with Ammonia Water. Ammonium Oxalate Solution should produce neither a turbidity nor a precipitate, nor should the addition of Sodium Phosphate Solution to the filtrate from the Ammonium Oxalate Solution cause any alteration. A crystal of the salt when moistened with Hydrochloric Acid and introduced into a non-luminous flame on a loop of platinum wire should not impart a persistent yellow coloration to the flame. When boiled with Liquor Potassæ an aqueous solution should not evolve an odour of Ammonia, nor should the issuing gas produce an alkaline reaction towards red Litmus paper. The aqueous solution should not afford an immediate yellow coloration when mixed with a little diluted Sulphuric Acid; when mixed with Chlorine Water the aqueous solution should afford when shaken with Carbon Bisulphide a distinct violet and not a brown coloration. A solution of the salt should not yield a pink coloration on the addition of Phenolphthalein Solution. Chlorides, if present, may be detected by shaking the precipitate produced on the addition of an excess of Silver Nitrate Solution, with Ammonia Solution, the filtrate should yield no decided turbidity nor a precipitate on acidification with diluted Nitric Acid.

The Ferrous Sulphate and Potassium Hydroxide test described below may be employed for the detection of Cyanides. In testing for Nitrates the *U.S.P.* employs the Potassium Hydroxide and Aluminium wire test described in small type below. The *P.G.* the Sodium Hydroxide Solution, Zinc filings and powdered Iron test. Chlorides, Bromides and Thiosulphates, if present, may be detected by the test with Volumetric Silver Nitrate Solution mentioned in small type. Barium, if present, may be detected by the Potassium Sulphate test described below.

A method has been described (*P.J.* '00 ii. 58) by which the Iodine only, in a mixture of Chloride, Bromide and Iodide of Potassium, may be determined. The process depends upon the liberation of Iodine alone from the mixture by the interaction of 5 p.c. Potassium Bichromate Solution and 10 p.c. Sulphuric Acid Solution. A weighed quantity of 0·5 of a gramme of a mixture of the salts is dissolved in 20 c.c. of Water, and 10 c.c. of a 5 p.c. Potassium Bichromate Solution is introduced, together with 10 c.c. of a 10 p.c. Sulphuric Acid Solution, the mixture is allowed to stand for a few minutes, shaking vigorously with 60 c.c. of Toluol. After separation the lower stratum is removed, the Toluol washed by agitation with small quantities of Water, adding the washings to the first portion separated. The mixed washings are again extracted with Toluol, which, if it be coloured violet, is added to that already separated. The mixed Toluol Solutions are then shaken with 35 c.c. of Tenth-normal Volumetric Sodium Thiosulphate Solution, the Thiosulphate Solution removed, the Toluol washed, the washings mixed with the Thiosulphate Solution, and the excess of Tenth-normal Volumetric Sodium Thiosulphate Solution titrated with Tenth-normal Volumetric Iodine Solution; from the amount of Tenth-normal Volumetric Sodium Thiosulphate Solution absorbed, the amount of Potassium Iodide may be readily calculated.

Litmus.—Crushed Potassium Iodide brought in contact with moistened red Litmus paper should not immediately colour it violet-blue, *P.G.* The aqueous solution is neutral or has a slightly alkaline reaction upon Litmus paper *U.S.P.*

Phenolphthalein.—A solution of 1 gramme of the salt in 10 c.c. of Water with 0·1 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution added should yield no coloration on the subsequent addition of a drop of Phenolphthalein T.S., even after heating, *U.S.P.*

Sulphuric Acid.—A solution of 0·5 gramme of the salt in 10 c.c. of previously boiled and cooled Distilled Water, with the addition of 2 drops of diluted Sulphuric Acid (free from Sulphurous and Nitrous Acids) should show no distinct yellow colour within half a minute, *U.S.P.* The boiled and cooled (1–20) aqueous solution should not be immediately coloured on the addition of Starch Solution and diluted Sulphuric Acid.

Hydrogen Sulphide.—The aqueous solution (1–20) should not be affected by T.S. of Hydrogen Sulphide, *P.G.;* slightly acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Barium Nitrate.—An aqueous solution (1–20) should not be affected by T.S. of Barium Nitrate, *P.G.*

Potassium Sulphate.—10 c.c. of an aqueous solution (1–20) acidulated with Hydrochloric Acid should not be rendered turbid by 1 c.c. of T.S. of Potassium Sulphate, *U.S.P.*

Potassium Ferrocyanide.—20 c.c. of an aqueous solution (1–20) acidulated with a few drops of Hydrochloric Acid should not be rendered blue by 0·5 c.c. of T.S. of Potassium Ferrocyanide, *P.G.*

Ferrous Sulphate and Potassium or Sodium Hydroxide.—If an aqueous solution (1-20) be gently warmed with a crystal of Ferrous Sulphate and 1 drop of Ferric Chloride T.S. after the addition of Sodium Hydroxide T.S., it should not be coloured blue when saturated with Hydrochloric Acid, *P.G.* The *U.S.P.* directs that 5 c.c. of the aqueous solution be gently heated with 1 drop of Ferrous Sulphate T.S. and 0·5 c.c. of T.S. of Potassium Hydroxide, no blue colour should appear when the mixture is acidulated with Hydrochloric Acid.

Aluminium Wire and Potassium Hydroxide; or Zinc, Iron and Sodium Hydroxide.—If 1 gramme of the salt be treated as described under Potassium Chlorate with Potassium Hydroxide T.S. and Aluminium wire the Litmus paper should show no blue coloration, *U.S.P.* 1 gramme of the salt warmed with 5 c.c. of Sodium Hydroxide T.S. and a mixture of 0·5 gramme of Zinc filings and powdered Iron should not evolve Ammonia, *P.G.*

Volumetric Silver Nitrate and Ammonia Solution.—If 0·2 gramme of the salt dissolved in 2 c.c. of Ammonia T.S. (10 p.c. *U.S.P.*) be mixed with 13 c.c. of Tenth-normal Silver Nitrate Volumetric Solution the mixture agitated and filtered, the filtrate after acidulation with Nitric Acid should not become opaque (more than slightly turbid, *U.S.P.*) nor should there be any darkening in colour within 10 minutes, *P.G.* and *U.S.P.*

Volumetric Determination.—Not less than 59·5 and not more than 61·9 c.c. of Silver Nitrate Volumetric Solution should be necessary to completely precipitate 1 gramme of the salt, *B.P*; 0·5 gramme of the well-dried salt dissolved in 10 c.c. of Distilled Water and 3 drops of Potassium Chromate T.S. added should require not more than 30·8 c.c. and not less than 30 c.c. of Tenth-normal Silver Nitrate Volumetric Solution to produce a permanent red colour, *U.S.P.*

Preparations.

LINIMENTUM POTASSII IODIDI CUM SAPONE. Liniment of Potassium Iodide with Soap.

Curd Soap, recently prepared and in shavings, 2 oz.; Potassium Iodide, 1½ oz.; Glycerin, 1 fl. oz.; Oil of Lemon, 1 fl. drm.; Distilled Water, 10 fl. oz. Dissolve the Soap and the Glycerin in the Water by the heat of a water-bath and pour the solution on to the powdered Potassium Iodide in a mortar, rub them together until the mixture is cold; after half an hour thoroughly mix in the Oil of Lemon. There will be a variable loss of Water in dissolving the Soap, and it should be made up to a weight when taken off the water-bath.

When first prepared it is very bulky, but after it has been made some time it occupies a much smaller space, and this is apt to cause trouble with patients. The difference is due to the quantity of air incorporated in it by the trituration, and is so great that it would be quite possible at different times for the same weight of Liniment to fill a 1 oz. pot and a 4 oz. pot.

The advantages of this Liniment are that it does not stain nor does it irritate when rubbed on the skin; it is employed in enlargement of the joints, and in indurated glands, especially the cervical glands.

Foreign Pharmacopœias.—Official in Swiss (Opodeldoc Iodatum), Lard or Butter, 50; Alcohol (95 p.c.), 25; Solution of Caustic Soda, 25; saponify and dissolve in Alcohol, 825; Sodium Iodide, 50; Water, 25; Oil of Lemon, 10. Swiss has also Opodeldoc Iodatum Liquidum. Not in the others.

Linimentum Saponato-Camphoratum cum Kalio Iodato.—Stearic Soap, 75; Venetian Soap, 75; Spirits of Wine, 600; Water, 98; Glycerin, 50; Potassium Iodide, 100; Lavender Oil, 2.—Austr.

UNGUENTUM POTASSII IODIDI. Potassium Iodide Ointment.

Potassium Iodide, 50; Potassium Carbonate, 3; Distilled Water (by weight), 47; Benzoated Lard, 400. Add the solution to the Lard in a slightly warmed mortar. (1 in 10)

Foreign Pharmacopœias.—Official in Dutch, Fr., Ger., Hung., Ital. Norw., Port., Russ., Span., Swiss and U.S., 1 in 10; Austr., Ger., Jap. and Russ., with Sodium Thiosulphate; Mex., (Pomada de Yoduro de Potasio) Potassium Iodide, 8; Benzoinated Lard, 60; Water, *q.s.* Not in Belg. or Dan.

Not Official.

LINIMENTUM POTASSII IODIDI.—Soft Soap, 2 oz.; Potassium Iodide, 1½ oz.; Glycerin, 1 fl. oz.; Oil of Lemon, 1 fl. drm.; Alcohol (60 p.c.), 10 fl. oz.—*Y.B.P.* '04, 510.

These quantities correspond to those of the official Liniment, but Soft Soap and Alcohol (60 p.c.) are used in place of Curd Soap and Distilled Water.

It contains twice as much Soap as Linimentum Saponis.

Soft Soap, 13·50; Potassium Iodide, 10; Glycerin, 7; Oil of Lemon, 1; Alcohol (60 p.c.), *q.s.* to produce 100.—*B.P.C.*

LINIMENTUM POTASSII IODIDI C. SAPONE (*B.P.* 1867).—Hard Soap, 1¼ oz.; Potassium Iodide, 1½ oz.; Glycerin, 1 fl. oz.; Oil of Lemon, 1 fl. drm.; Water, 10 fl. oz. 'Put the Glycerin, Iodide, and 3 fl. oz. of Water in a clean 20-oz. wide-mouthed bottle; then dissolve the Soap (in shavings) in the 7 fl. oz. of Water in a jar by the heat of a water-bath; strain the solution whilst hot through muslin into the bottle containing the Iodide, etc.; allow to stand for 2 or 3 minutes, until the bottom of the Soap Solution is a little opaque, then mix by agitation; lastly add the Oil of Lemon, shaking briskly, and, after agitating at intervals for 2 hours or more, a liniment in the form of a soft white jelly will result, and remain so; if it should not, a small addition of Water will generally perfect it.'

This formula is that of *B.P.* '67, but the manipulation has been modified; when made properly it gives satisfaction.

MISTURA POTASSII IODIDI.—Potassium Iodide, 10 grains; Potassium Bicarbonate, 5 grains; Pimento Water to 1 fl. oz.—*Brompton.*

MISTURA POTASSII IODIDI ALKALINA.—Potassium Bicarbonate, 15 grains; Ammonium Carbonate, 3 grains; Potassium Iodide, 3 grains; Camphor Water to 1 fl. oz.—*Brompton.* Potassium Iodide, 3 grains; Potassium Bicarbonate, 10 grains; Ammonium Carbonate, 3 grains; Camphor Water, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

MISTURA POTASSII IODIDI ET STRAMONII.—Extract of Stramonium, ¼ grain; Extract of Liquorice, 2 grains; Potassium Iodide, 3 grains; Chloric Ether, 5 minims; Water to 1 fl. oz.—*Brompton.* Potassium Iodide, 3 grains; Tincture of Stramonium, 5 minims; Liquid Extract of Liquorice, 10 minims; Emulsion of Chloroform, 10 minims; Water, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

PILULÆ KALII IODATI.—Potassium Iodide, 20; Powdered Starch, 5; Simple Syrup, *q.s.*—*Belg.*

POMADA DE YODURO POTASICO CON EXTRACTO DE CICUTA.—Potassium Iodide Ointment, 80; Extract of Conium, 10; Distilled Water, *q.s.*—*Span.*

POTASSII NITRAS.

POTASSIUM NITRATE.

B.P.Syn.—NITRE, SALTPETRE.

N.O.Syn.—AZOTATE DE POTASSE.

KNO_3, eq. 100·41.

FR., AZOTATE DE POTASSIUM: GER., KALIUMNITRAT; ITAL., NITRATO DI POTASSIO; SPAN., NITRATO POTASICO.

Colourless, transparent, rhombic prisms, or a white odourless, crystalline powder, having a cooling saline taste. It is obtained by purifying Crude Nitre, or from Sodium Nitrate.

It should be kept in well-stoppered glass bottles, as it has a slight tendency to deliquesce in moist air.

Solubility.—1 in 4 of cold Water; 2½ in 1 of boiling Water; sparingly in Alcohol (90 p.c.).

Medicinal Properties.—Sometimes given as a diuretic and diaphoretic, but the Acetate and Citrate are much to be preferred.

Useful as a gargle in relaxed sore throat. Potassium Nitrate 5 grains, Potassium Bicarbonate 20 grains, taken, during effervescence, with Citric Acid 15 grains, in a small tumbler of cold Water, is a pleasant cooling draught in febrile conditions. A common ingredient of asthma inhalation powders. Charta Nitrata is used in spasmodic asthma.

15 grains of Potassium Nitrate with ½ grain Sodium Nitrite useful for lessening high arterial tension and arresting epistaxis; 15 grains of Potassium Nitrate along with Potassium Bicarbonate and ½ grain of Sodium Nitrite; useful for the same purpose in gouty subjects.—*L.* '02, ii. 331; *B.M.J.* '02, ii. 504.

Used for its slight antiseptic effect to assist in preserving canned meat, and to give it a red colour. Amount should be restricted to 2 grains per pound. —*Roy. Army Med. Corps Jour.* '08, i. 124.

Dose.—5 to 20 grains = 0·32 to 1·3 grammes.

Official Preparations.—Contained in Argenti Nitras Induratus and Argenti Nitras Mitigatus. Used in the preparation of Acidum Nitricum.

Not Official.—Mistura Salina, Mistura Salina Anodyna, Sal Prunella, Charta Nitrata, Charta Nitrata et Chlorata.

Foreign Pharmacopœias.—Official in all; Austr., Belg., Ger., Hung., Jap.,, Russ. and Swiss (Kalicum Nitricum); Dan., Dutch, Norw. and Swed. (Nitras Kalicus); Fr. (Azotate de Potassium); Ital. (Nitrato di Potassio); Mex. (Nitrato de Potasio); Port. (Azotato de Potassa); Span. (Nitrato Potasico); U.S. (Potassii Nitras).

Tests.—Potassium Nitrate when heated fuses. The *U.S.P.* states at a temperature of 353° C. (667·4° F.), when still more strongly heated it is decomposed, giving off Oxygen and leaving a residue of Potassium Nitrate, Nitrite and Oxide. It dissolves readily in Water, forming a clear solution which is neutral in reaction towards Litmus paper, and which yields the tests given under Potassium. An aqueous solution when cautiously mixed with Sulphuric Acid, keeping the mixture cool, affords when a solution of Ferrous Sulphate is carefully poured on to the surface of the mixture a dark brown ring at the junction of the two fluids. 1 or 2 drops of a Diphenylamine Solution (prepared by dissolving 0·1 of a gramme of Diphenylamine in 50 c.c. of Diluted Sulphuric Acid) when mixed with an aqueous solution affords a deep blue colour at the point of contact of the two liquids when Sulphuric Acid is carefully poured into the liquid, so as to form a separate layer. An aqueous solution acidified with Sulphuric Acid immediately discharges the colour of indigo solution; when warmed with Sulphuric Acid and Copper foil an evolution of nitrous fumes ensues. The *U.S.P.* states that the salt shall contain not less than 99 p.c. of pure Potassium Nitrate, but gives no method of determination. Neither the *B.P.* nor the *P.G.* states a requisite percentage nor includes a method of determination.

The more generally occurring impurities are Aluminium, Ammonium, Calcium, Copper, Iron, Lead, Magnesium, Sodium, Zinc, Chlorides, Iodides and Sulphates. The *U.S.P.* includes tests for Chlorate and Perchlorate. The aqueous solution of the salt should afford neither a turbidity nor a precipitate when boiled with Ammonia Solution. It should yield no reaction for Arsenic, Copper, Iron, Lead or Zinc when examined by the Hydrogen Sulphide test described in small type below. It should not yield a reaction for Calcium or Magnesium when examined by the Ammonium Oxalate and Sodium Phosphate tests described below, nor for Chloride, Sulphate, Iodide, Chloride or Perchlorate when examined by the tests under Silver Nitrate, Barium Nitrate, Chlorine and Chloroform, and Sulphuric Acid given in the small type below. The *P.G.* includes a separate test for Iron with Potassium Ferrocyanide Solution.

Flame.—Heated on Platinum wire it colours the flame violet, only a transitory yellow colour appearing, *P.G.*

Hydrogen Sulphide.—The aqueous solution (1–20) should not be affected by T.S. of Hydrogen Sulphide, either before or after the addition of Ammonia Water, *P.G.*; when slightly acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Ammonium Oxalate.—An aqueous solution (1–20) after the addition of Ammonia T.S. should not be affected by T.S. of Ammonium Oxalate, *P.G.*

Sodium Phosphate.—An aqueous solution (1–20) after the addition of Ammonia T.S. should not be affected by T.S. of Sodium Phosphate, *P.G.*

Barium Nitrate.—An aqueous solution (1–20) should not be affected by T.S. of Barium Nitrate, *P.G.*

Silver Nitrate.—An aqueous solution (1–20) should not be affected by T.S. of Silver Nitrate, *P.G.*

Potassium Ferrocyanide.—20 c.c. of an aqueous solution (1–20) should not be rendered blue by 0·5 c.c. of T.S. of Potassium Ferrocyanide, *P.G.*

Chlorine and Chloroform.—If to 10 c.c. of the aqueous solution (1–20) of the salt 1 c.c. of Chloroform be added and Chlorine Water introduced drop by drop with agitation, the Chloroform should not acquire a violet tint, *U.S.P.*

Sulphuric Acid.—If 0·1 gramme of the salt be sprinkled upon 1 c.c. of Sulphuric Acid the latter should not become coloured, *P.G.;* no yellow colour should appear, *U.S.P.*

Not Official.

MISTURA SALINA.—Potassium Nitrate, 5 grains; Spirit of Nitrous Ether, 20 minims; Burnt Sugar, 5 minims; Camphor Water, to ½ fl. oz.—*Central Throat.*

Potassium Nitrate, 10 grains; Solution of Ammonium Acetate, 3 fl. drm.; Spirit of Nitrous Ether, 30 minims; Water. to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

Potassium Citrate, ½ drm.; Spirit of Nitrous Ether, 30 minims; Solution of Acetate of Ammonium, 1 fl. drm.; Camphor Water, to 1 fl. oz.—*St. Mary's.*

Potassium Nitrate, 10 grains; Solution of Ammonium Acetate, 3 fl. drm.; Spirit of Nitrous Ether, 30 minims; Water, to ½ fl. oz.—*London.*

MISTURA SALINA ANODYNA.—Tincture of Opium, 10 minims; Saline Mixture, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

SAL PRUNELLA.—Potassium Nitrate fused and moulded into balls.

CHARTA NITRATA (Austr., Belg., Dan., Fr., Ger., Ital., Norw., Port., Swed. and Swiss).—Soak porous paper in a saturated solution of Nitre, and dry. Roll it up and burn in a candlestick. Used in asthma.

The paper is sometimes impregnated also with Compound Tincture of Benzoin, Spirit of Camphor, Oils of Cassia, Cinnamon and Santal, and Tincture of Sumbul.

CHARTA NITRATA ET CHLORATA.—Soak porous paper in a saturated solution of Potassium Nitrate and Potassium Chlorate, and dry. Used in asthma.

POTASSII PERMANGANAS.

POTASSIUM PERMANGANATE.

N.O.Syn. –KALIUM HYPERMANGANICUM.

$K_2Mn_2O_8$, eq. 313·74.

FR., PERMANGANATE DE POTASSIUM; GER., KALIUMPERMANGANAT; ITAL., PERMANGANATO DI POTASSIO; SPAN., PERMANGANATO POTASICO.

Slender, dark, purple, odourless, prismatic crystals, possessing a purplish-blue metallic lustre, and a peculiar characteristic taste, at first sweet and afterwards unpleasant and somewhat astringent.

It should be kept in well-stoppered bottles and protected as far as possible from the light and from dust. When pure it is a permanent salt.

It should be handled with caution as when brought into contact with easily oxidisable substances, *e.g.*, Alcohol, Gallic and Tannic Acid, Glycerin, essential Oils, etc., it readily parts with its Oxygen, the action being very violent and frequently attended by explosion. Its solutions when mixed with Hydrogen Peroxide evolve nascent Oxygen.

Solubility.—1 in 18 of Water; 1 in 3 of boiling Water.

Medicinal Properties.—A powerful deodorant, a weak antiseptic. Useful internally in amenorrhœa. Externally, as a wash for foul ulcers and chancres and in ozœna; as an antiseptic gargle in throat affections.

In snake bites, Lauder Brunton recommends that the wound be scraped with a clean knife, and then powdered crystals of Potassium Permanganate rubbed into the wound.

Weak solution (1 in 2000) injected in gonorrhœa.—*B.M.J.E.* '95, i. 60; *M.P.* '95, i. 431; *B.M.J.E.* '89, ii. 88.

A 1 in 2000 solution as a douche in vulvo-vaginitis in children.—*Pr.* lxxiv. 225.

Case of poisoning by repeated small doses (about 2 grains). Recovery.—*L.* '99, ii. 1468.

Found always a valuable remedy in snake bites if given in time.—*L.* '02, ii. 1711; '03, i. 133; *P.J.* '03, i. 13; *L.* '05, ii. 609.

In certain forms of menstrual suffering. Striking and permanent results obtained by its use.—*L.* '02. ii. 1757.

In asylum dysentery, the lower bowel washed out night and morning with a weak solution (2 to 4 grains to the pint).—*L.* '02, i. 588.

In lupus, painting with a saturated solution, or dusting with powdered Permanganate.—*B.M.J.E.* '02, i. 55; *B.M.J.* '03, ii. 194.

Dose.—1 to 3 grains = 0·06 to 0·2 gramme.

Prescribing Notes.—*It can be made into a* pill *with Massa Paraffini. It is not given in solution on account of its disagreeable taste.*

It is the practice to coat Permanganate pills with Sandarach varnish, but the Alcohol contained in the varnish is liable to be oxidised at the expense of the Permanganate.

Incompatibles.—Animal or vegetable matters, and any reducing agent. It is an antidote to Morphine.

Official Preparation.—Liquor Potassii Permanganatis.

Not Official.—Gargarisma Potassii Permanganatis, Calcii Permanganas and Sodii Permanganas.

Foreign Pharmacopœias.—Official in U.S.; Austr. (Kalium Hypermanganicum crystallisatum); Belg. (Kalium Permanganicum); Dan., Norw. and Swed. (Hypermanganas Kalicus); Dutch (Permanganas Kalicus); Fr. (Permanganate de Potassium); Ger. and Jap. (Kalium Permanganicum); Hung., Russ. and Swiss (Kalium Hypermanganicum); Ital. (Permanganato di Potassio); Mex. (Permanganato de Potasio); Port. (Permanganato de Potassa); Span. (Permanganato Potasico); Ital. has also a crude salt for disinfecting purposes.

Tests.—Potassium Permanganate when heated decrepitates, and when more strongly heated it decomposes, with the evolution of Oxygen, leaving a residue of Potassium Manganate and Manganese Dioxide. It dissolves in Water, forming a deep purple coloured solution which is neutral in reaction towards Litmus paper. The aqueous solution of the residue obtained on strongly heating the salt is alkaline in reaction towards red Litmus paper. When heated with a mixture of Alcohol, Water and Sulphuric Acid it evolves an odour of Acetaldehyde, the purple-coloured solution becoming colourless, and it then affords the tests distinctive of Potassium given under that heading. The addition of Oxalic Acid Solution, Ferrous Sulphate Solution or Hydrogen Dioxide Solution to an acidified aqueous solution immediately decolorises it. It is officially required to yield 97·9 p.c. of pure Potassium Permanganate, as volumetrically determined by titration with Normal Volumetric Oxalic Acid Solution as described in the small type below. The *U.S.P.* requires that it should contain not less than 99 p.c. of pure Potassium Permanganate as volumetrically determined by titration with Tenth-normal Volumetric Oxalic Acid Solution as described below. The *P.G.* does not include a method of determination.

The more generally occurring impurities are Aluminium, Ammonium, Calcium, Iron, Lead, Magnesium and Sodium, Carbonates, Chlorides, Nitrates and Sulphates. In testing for these impurities a solution of the salt should be treated with sufficient Alcohol to cause complete decolorisation and the liquid filtered, a portion of the filtered liquid should neither afford a turbidity nor a flocculent precipitate when boiled with Ammonia Solution; it should not evolve an odour of Ammonia when boiled with Potassium Hydroxide Solution; when acidified with diluted Hydrochloric Acid it should afford no darkening in colour on the addition of Hydrogen Sulphide Solution. When treated with Ammonium Chloride Solution and Sodium Phosphate Solution it should afford neither a distinct turbidity nor a precipitate. A solution of the salt should not possess a decidedly alkaline reaction to red Litmus paper. A portion of the solution decolorised by Alcohol should afford no reaction when examined by the Silver Nitrate, Barium Chloride or Diphenylamine and Sulphuric Acid tests described below. In testing for Nitrates the *P.G.* decolorises the Potassium Permanganate with Oxalic Acid and examines the filtrate with the Sulphuric Acid and Ferrous Sulphate test described in the small type paragraph.

Litmus.—An aqueous solution is neutral to Litmus, *P.G.* and *U.S.P.*

For applying tests of purity the *P.G.* and *U.S.P.* direct the preparation of a solution as follows:—0·5 gramme of the salt is boiled with 2 c.c. of Alcohol and 25 c.c. of Water and the liquid filtered. The *U.S.P.* directs 4 c.c. of Alcohol, 20 c.c. of Water, and boiling until the salt is completely decomposed. The filtrate is clear and colourless.

Barium Chloride or Nitrate.—5 c.c. of the above filtrate acidulated with Nitric Acid should not be rendered more than very slightly turbid by T.S. of Barium Chloride, *U.S.P.*; not more than opalescent by T.S. of Barium Nitrate, *P.G.*

Silver Nitrate.—Another portion of the filtrate acidulated with Nitric Acid should give with Silver Nitrate T.S. no precipitate or cloudiness, *U.S.P.*; should not be rendered more than opalescent, *P.G.*

Diphenylamine and Sulphuric Acid.—If to another portion of 5 c.c. of the filtrate 1 drop of Diphenylamine T.S. be added, and then 1 c.c. of Sulphuric Acid be introduced so as to form a layer beneath, no blue colour should appear at the line of contact, *U.S.P.*

Oxalic Acid, Sulphuric Acid and Ferrous Sulphate.—If Oxalic Acid be gradually added to a solution of 0·5 gramme of the salt in 5 c.c. of hot Water until decolorisation occurs and then filtered, 2 c.c. of the filtrate mixed with 2 c.c. of Sulphuric Acid and 1 c.c. of Ferrous Sulphate T.S. poured on as a layer should not give any coloured zone, *P.G.*

Volumetric Determination.—1 gramme of the salt dissolved in Water, and mixed with 5 c.c. of diluted Sulphuric Acid should require 31·2 c.c. of Normal Oxalic Acid Volumetric Solution for complete decolorisation, *B.P.* The *U.S.P.* directs 0·1 gramme of the salt to be dissolved in 100 c.c. of Water to which 1 c.c. of Sulphuric Acid and 35 c.c. of Tenth-normal Volumetric Solution of Oxalic Acid have been previously added, when not more than 3·5 c.c. of Tenth-normal Volumetric Potassium Permanganate Solution should be required to impart a permanent pink tint.

Preparation.

LIQUOR POTASSII PERMANGANATIS. Solution of Potassium Permanganate.

Dissolve 87½ grains of Potassium Permanganate in Distilled Water, *q.s.* to yield 20 fl. oz. (1 in 100)

Dose.—2 to 4 fl. drm. = 7·1 to 14·2 c.c.

110 minims contain 1 grain.

If it needs filtration, glass-wool is best for the purpose.

Diluted with 40 to 80 parts of Water, is useful as a **gargle**, or as a cleansing **wash** for foul ulcers, etc.

Foreign Pharmacopœias.—Official in Mex., 1 in 500. Not in the others.

Not Official.

GARGARISMA POTASSII PERMANGANATIS.—Solution of Potassium Permanganate, 12 minims; Water, to 1 fl. oz.—*St. Mary's, University* and *Westminster.*

Solution of Potassium Permanganate, ½ fl. oz.; Water, *q.s.* to make 20 fl. oz. —*St. Thomas's.*

The deodorant and disinfectant properties of this gargle may be increased by the addition of 2 minims of diluted Sulphuric Acid per fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

Solution of Potassium Permanganate, 10 minims; Water, to 1 fl. oz.—*London.*

Potassium Permanganate, ⅛ grain; Water, to 1 fl. oz.—*Throat.*

CALCII PERMANGANAS.—Purplish-red, crystalline masses, deliquescent and very soluble in Water. It is a powerful disinfectant and deodorant. It is stated to be less nauseous than the Potassium salt, but there is not much difference between them, in this respect.

Strychnine Sulphate and Hydrochloride, Morphine, and Aconitine have been shown to yield an innocuous product when treated with a 5 p.c. solution of this salt.—*J.C.S.* 1905, *Abs.* i. 107.

Sodii Permanganas in solution is used as a disinfectant. It is so soluble in Water that it is difficult to crystallise.

POTASSII SULPHAS.

POTASSIUM SULPHATE.

K_2SO_4, eq. 173·00.

Fr., Sulfate Neutre de Potassium; Ger., Kaliumsulfat; Ital., Solfato di Potassio; Span., Sulfato Potasico.

Hard, transparent, colourless, six-sided, rhombic prisms, terminated by pyramids, or a white, odourless powder, having a somewhat bitter saline taste. Permanent in the air.

Potassium Sulphate was long known as **Sal Polychrestum**, and the Bisulphate (the residue from making Nitric Acid) as **Sal Enixum**.

In Scotland, Sal Polychrestum means Sulphas Potassæ c. Sulphure.—*Ph. Edinburgh.*

Solubility.—1 in 10 of cold Water, 1 in 4 of boiling Water. Insoluble in Alcohol (90 p.c.).

Medicinal Properties.—Mild, saline cathartic, usually operating without irritation if given well diluted. Generally given in combination with Rhubarb. A useful purgative in hepatic sluggishness.

Dose.—10 to 40 grains = 0·65 to 2·6 grammes.

Official Preparations.—Used in the preparation of Pilula Colocynthidis Composita and Pulvis Ipecacuanhæ Compositus. Contained in Pilula Colocynthidis et Hyoscyami, and Pilula Ipecacuanhæ cum Scilla.

Foreign Pharmacopœias.—Official in U.S.; Dan., Dutch, Norw. and Swed. (Sulphas Kalicus); Fr. (Sulfate Neutre de Potassium); Belg., Ger., Hung., Jap., Russ. and Swiss (Kalium Sulfuricum); Mex. (Sulfato de Potasio); Port. (Sulfato de Potassa); Span. (Sulfato Potasico). Not in Austr.

Tests.—Potassium Sulphate when heated decrepitates and fuses at a bright red heat. It dissolves in Water, forming a clear solution which should be neutral in reaction towards Litmus paper and which should yield the tests distinctive of Potassium given under that heading, and which should yield with Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid. It is officially required to yield 99·9 p.c. of pure Potassium Sulphate as gravimetrically determined by precipitation as Barium Sulphate; the washed and dried precipitate from a solution of 1 gramme of the salt in Water, acidulated with Hydrochloric Acid, is required to weigh 1·339 grammes. The *U.S.P.* states that it should contain not less than 99 p.c. of pure Potassium Sulphate, but gives no method of determination. The *P.G.* gives neither a requisite percentage of Sulphate nor a method of determination.

The more generally occurring impurities are Arsenic, Calcium, Copper, Iron, Lead, Magnesium, Sodium and Zinc. The *B.P.* includes also Aluminium and Ammonium. Chlorides and Nitrates are also likely impurities, as also Acid Potassium Sulphate. Arsenic, if present, may be detected by the modified Gutzeit's test. Iron, Copper, Lead and Zinc, if present, are indicated by the Hydrogen Sulphide test described below; the *P.G.* includes a separate test for Iron with Potassium Ferrocyanide Solution; Calcium and Magnesium by the Ammonium Oxalate and Sodium Phosphate tests described in small type. Aluminium may be detected by the turbidity or flocculent precipitate produced on boiling the solution with Ammonia Solution. Ammonium salts by the evolution of Ammonia gas when a solution of the sample is boiled with Liquor Potassæ. Chlorides, if present, may be detected by the Silver Nitrate test described in small type. Acid Potassium Sulphate, if present, is indicated by the behaviour of the aqueous solution of the specimen towards Litmus paper, solutions of the Acid Sulphate have a decidedly acid reaction towards blue Litmus paper. A solution of the salt, when carefully mixed with Sulphuric Acid, the mixture being kept cool, should afford no brown ring at the junction of the two liquids when a Solution of Ferrous Sulphate is carefully poured upon its surface.

Hydrogen Sulphide.—The aqueous solution (1-20) should not be affected by T.S. of Hydrogen Sulphide, *P.G.*; slightly acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals.—*U.S.P.*

Gutzeit's Test.—5 c.c. of an aqueous solution of the salt (1-10) should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Ammonium Oxalate.—The aqueous solution (1-20) of the salt should not be affected by T.S. of Ammonium Oxalate, *P.G.*

Silver Nitrate.—The aqueous solution (1-20) of the salt should not be affected by T.S. of Silver Nitrate, *P.G.*

Sodium Phosphate.—The aqueous solution (1-20) of the salt should not be affected by T.S. of Sodium Phosphate, *P.G.*

Potassium Ferrocyanide.—20 c.c. of an aqueous (1-20) solution of the salt should not be rendered blue by 0·5 c.c. of T.S. of Potassium Ferrocyanide, *P.G.*

POTASSII TARTRAS.

POTASSIUM TARTRATE.

$\mathbf{K_2C_4H_4O_6}$, $\mathbf{H_2O}$, eq. 242·46.

Fr., Tartrate de Potasse Neutre; Ger., Kaliumtartrat; Ital., Tartrato Neutro di Potassio; Span., Tartrato Potasico Neutro.

Colourless, translucent, prismatic crystals, or as a white, crystalline, slightly deliquescent powder, having a saline and bitter taste. It may be obtained by neutralising the Acid Tartrate with Potassium Carbonate.

Solubility.—10 in 6 of Water. Insoluble in Alcohol (90 p.c.).

Medicinal Properties.—A mild, saline purgative, operating without much pain, and producing watery stools. In [illegible]maller doses, antacid, diuretic and alterative.

Dose.—30 to 240 grains = 2 to 16 grammes.

Foreign Pharmacopœias.—Official in Dan. and Norw. (Tartras Kalicus); Ger., Hung., Jap. and Russ. (Kalium Tartaricum); Ital. (Tartrato Neutro di Potassio); Mex. (Tartrato de Potasio Neutro); Port. (Tartarato de Potassa); Span. (Tartrato Potasico Neutro). Not in Austr., Belg., Dutch, Fr., Swiss or U.S.

Tests.—Potassium Tartrate when heated decomposes, evolving an odour of burnt sugar and leaving behind a black residue, the aqueous solution of which possesses an alkaline reaction towards red Litmus paper. It dissolves readily in Water, forming a solution which has a slightly alkaline reaction towards red Litmus paper. When acidified with Hydrochloric Acid it should yield the tests distinctive of Potassium given under that heading. The aqueous solution yields on the addition of Calcium Chloride Solution in excess a white granular precipitate soluble when freshly precipitated in cold, moderately concentrated Potassium Hydroxide Solution, re-precipitated on boiling, it is soluble also in diluted acids. Silver Nitrate Solution affords a white precipitate soluble in diluted Nitric Acid and in Ammonia Solution; the solution obtained by the use of the latter reagent, when boiled in a perfectly clean test-tube, deposits a mirror of metallic Silver on the sides of the tube. When mixed with Ferrous Sulphate Solution, a few drops of Hydrogen Peroxide Solution and an excess of Potassium Hydroxide Solution, a purple or violet coloration is produced. It is officially required to contain 101·8 p.c. of pure Potassium Tartrate as volumetrically determined by the direct titration of the solution of the residue left on ignition of the dried salt, with Volumetric Sulphuric Acid Solution, the inaccuracy being due to the incorrectness of the official formula. The salt is official in the *P.G.*, but no requisite percentage of pure Tartrate is indicated, nor is a method of determination given.

The more generally occurring impurities are Calcium, Copper, Iron and Lead, Magnesium, Sodium, Chlorides, Sulphates and Acid Potassium Tartrate. Calcium, if present, may be detected by Ammonium Oxalate test after separation of the greater portion of the Potassium Tartrate as insoluble Acid Tartrate of Potash by precipitation with diluted Acetic Acid. Copper, Lead, and Iron may be detected by the Hydrogen Sulphide test described below; the *P.G.* includes a separate test for Iron with Potassium Ferrocyanide Solution; Magnesium by Sodium Phosphate Solution; Chlorides and Sulphates may be detected by the Barium Nitrate and Silver Nitrate tests described in the small type paragraphs. Potassium Acid Tartrate, if present, may be detected by the behaviour of the aqueous solution towards blue Litmus paper, Acid Potassium Tartrate having a decidedly acid reaction. The salt should not evolve an odour of Ammonia when warmed with Sodium Hydroxide Solution; when acidified with Hydrochloric Acid and inserted on a loop of platinum wire into a non-luminous flame it should not colour the flame a distinct or permanent yellow colour.

Acetic Acid and Ammonium Oxalate.—If 1 gramme of Potassium Tartrate be dissolved in 10 c.c. of Water and the solution agitated with 5 c.c. of Diluted Acetic Acid a crystalline separation occurs. The liquid poured off and diluted with an equal part of Water should not be affected by 8 drops of Ammonium Oxalate T.S. within 1 minute, *P.G.*

Hydrogen Sulphide.—The aqueous solution (1–20) should not be affected by T.S. of Hydrogen Sulphide, *P.G.*

Barium Nitrate.—The aqueous solution (1–20), after the addition of Nitric

Acid and the removal of the crystalline precipitate formed, should not be affected by T.S. of Barium Nitrate, *P.G.*

Silver Nitrate.—Another portion of an aqueous solution treated as above should not be rendered more than opalescent by T.S. of Silver Nitrate, *P.G.*

Potassium Ferrocyanide.—20 c.c. of an aqueous solution (1–20) should not be rendered blue by 0·5 c.c. of T.S. of Potassium Ferrocyanide, *P.G.*

Volumetric Determination.—The filtered aqueous solution obtained by dissolving in Water, the alkaline residue left on exposing 1 gramme of the salt to a red heat should neutralise 8·4 c.c. of Volumetric Sulphuric Acid Solution, *B.P.*

POTASSII TARTRAS ACIDUS.

ACID POTASSIUM TARTRATE.

B.P.Syn.—Bitartrate of Potassium; Purified Cream of Tartar.

N.O.Syn.—Tartarus Depuratus. Kalium Hydrotartaricum.

$KC_4H_5O_6$, eq. 186·75.

Fr., Tartrate Acide de Potassium; Ger., Weinstein; Ital., Tartrato Acido di Potassio; Span., Bitartrato Potasico.

Colourless or slightly opaque rhombic crystals, or masses of crystals, or as a white, crystalline, gritty powder, permanent in the air. Its chief source is the crude Cream of Tartar or Argol, deposited during vinous fermentation.

It should be kept in well-stoppered glass bottles.

Solubility.—1 in 200 of cold Water, 1 in 16 of boiling Water. Insoluble in Alcohol (90 p.c.).

Medicinal Properties.—Cathartic, diuretic and refrigerant. Much used in febrile and dropsical affections; in chronic cardiac and hepatic diseases; combined with Sulphur it is a useful laxative in hæmorrhoids.

'Imperial Drink' for patients suffering from the thirst accompanying chronic Bright's disease, Acid Tartrate, 1 drm.; Saccharin, 1 grain; Lemon Oil, 3 minims; boiling Water, to 1 pint.—*Pr.* lxvii. 656.

Dose.—20 to 60 grains = 1·3 to 4 grammes.

Official Preparations.—Contained in Confectio Sulphuris, Trochiscus Sulphuris, and Pulvis Jalapæ Compositus. Used in the preparation of Acidum Tartaricum, Antimonium Tartaratum, Ferrum Tartaratum, Potassii Tartras, and Soda Tartarata.

Not Official.—Soluble Cream of Tartar.

Foreign Pharmacopœias.—Official in all; Austr. and Hung. (Kalium hydrotartaricum); Belg. (Bitartras Potassæ depuratus); Dan., Norw. and Swed. (Bitartras Kalicus); Dutch (Tartras Kalicus Acidus); Fr. (Tartrate Acide de Potassium); Ger. and Swiss (Tartarus depuratus); Ital. (Tartrato Acido di Potassio); Jap. (Kalium Bitartaricum); Mex. (Tartrato de Potasio Acido); Port. (Bitartrato de Potassa); Russ. (Kalium Bitartaricum depuratum and Purum; Span. (Bitartrato Potasico); U.S. (Potassii Bitartras).

Tests.—Potassium Acid Tartrate when strongly heated chars and emits inflammable vapours. When still more strongly heated it leaves a blackish residue, which, when dissolved in Water, filtered and neutralised with Hydrochloric Acid, affords the tests distinctive of Potassium given under that heading. When neutralised with Potassium or Sodium Hydroxide Solution it yields, on the addition of Calcium Chloride Solution in excess, a white granular precipitate soluble when freshly precipitated in cold, moderately concentrated Potassium Hydroxide Solution, reprecipitated on boiling. In a similar solution Silver Nitrate Solution yields a white precipitate soluble in Nitric Acid and in Ammonia Solution; its solution in the latter reagent, when boiled in a perfectly clean test-tube, affords a mirror of metallic Silver on the sides of the tube. It is slightly soluble in Water, the solution being acid in reaction towards blue Litmus paper. It is officially required to contain 97·1 p.c. of pure Potassium Hydrogen Tartrate as volumetrically determined by direct titration of the salt with Volumetric Sodium Hydroxide Solution as indicated below. The direct titration of a sample should be supplemented by a determination of the alkalinity of the soluble ash. A sample containing a judicious proportion of Potassium Acid Sulphate might pass the direct titration test, but would show a reduced alkalinity of the ash. In a pure sample the amount of Volumetric Sodium Hydroxide Solution required by direct titration should be equal to the amount of Volumetric Acid Solution required to neutralise the soluble ash, working on the same weight of substance in each case. The *U.S.P.* requires the salt to contain not less than 99 p.c. of pure Potassium Bitartrate as volumetrically determined by titrating with Semi-normal Volumetric Sulphuric Acid Solution, the solution obtained by extracting the residue left after ignition with Water, using Methyl Orange Solution as an indicator.

The more generally occurring impurities are Copper and Iron, with the tests for which it is officially required to show no characteristic reaction; Calcium, Magnesium, Sodium, Chlorides or Sulphates, with the tests for which it it officially required to show only the slightest reaction. The term ‘slightest reaction’ in this instance appears to be defined by the total limit of 2½ p.c. on the dried salt, the official requirement being that this amount of impurity should not be exceeded. Lead, Copper and Iron, if present, are shown by the Hydrogen Sulphide test described below; Calcium by the Ammonium Oxalate test; Magnesium by the addition of Sodium Phosphate Solution to the filtrate from the Ammonium Oxalate. A standard has been suggested (*C.D.* ’08, i. 796) of 5 parts per million for Lead and 2 parts per million for Arsenic. Chlorides and Sulphates, if present, are indicated by the Silver Nitrate and Barium Chloride tests given below. In addition to the above-named impurities, Starch, Kaolin, Calcium Phosphate and other insoluble matter, Ammonium salts, Aluminium and Phosphates may be present, and the *U.S.P.* includes tests for these impurities. The undermentioned test with Ammonia Water serves as a test for Starch, Kaolin, Calcium Phosphate and other insoluble matter. The presence of Ammonium salts is indicated by the behaviour of the solution when examined by the tests with Potassium or Sodium

Hydroxide Solution, Aluminium by the Potassium Hydroxide test after ignition, and Phosphate by the Ammonium Molybdate test given below. A method for the exhaustive examination of Cream of Tartar is given (*Analyst*, '96, 174).

Ammonia.—A solution of 0·5 gramme of the salt in 3 c.c. of Ammonia T.S. should leave no insoluble residue, *U.S.P.*

Barium Nitrate.—5 grammes of the salt agitated with 100 c.c. of Water and filtered, should give a filtrate which, after the addition of Nitric Acid, should not be affected by T.S. of Barium Nitrate, *P.G.*

Silver Nitrate.—A filtrate obtained as above should not be rendered more than faintly opalescent with T.S. of Silver Nitrate after the addition of Nitric Acid, *P.G.*

Hydrogen Sulphide.—The solution of 1 gramme of the salt in Ammonia T.S. should not be affected by T.S. of Hydrogen Sulphide, *P.G.* The *U.S.P.* requires that the aqueous solution of the salt, slightly acidulated with Hydrochloric Acid, should not respond to the time-limit test for heavy metals.

Potassium or Sodium Hydroxide.—If the salt be warmed with Sodium Hydroxide T.S. (15 p.c.) it should not evolve Ammonia, *P.G.* The *U.S.P.* uses Potassium Hydroxide T.S.

Ammonium Oxalate.—If a mixture of 1 gramme of the salt with 5 c.c. of diluted Acetic Acid be allowed to stand for half an hour with frequent agitation and then mixed with 25 c.c. of Water, the clear liquid poured off from the deposit should show no alteration within 1 minute on the addition of 8 drops of T.S. of Ammonium Oxalate, *P.G.*

Potassium Hydroxide Solution after Ignition.—If 1 gramme of Potassium Bitartrate be well triturated with about 1 gramme of Potassium Carbonate and 0·5 gramme of Potassium Nitrate, and the mixture heated gradually to dull redness in a porcelain crucible, and if, upon cooling, the resulting mass be treated with a slight excess of diluted Hydrochloric Acid and filtered, the filtrate, upon being made slightly alkaline with Potassium Hydroxide T.S., should not yield a gelatinous precipitate soluble in excess of the reagent (absence of Alum), *U.S.P.*

Ammonium Molybdate Solution.—If a precipitate be produced which is insoluble it should be collected and thoroughly washed with hot Distilled Water, and dissolved in hot diluted Nitric Acid; the addition of an excess of Ammonium Molybdate T.S. to this solution should not produce a yellow precipitate (absence of Phosphates), *U.S.P.*

Volumetric Determination.—Not less than 5·2 c.c. of Sodium Hydroxide Volumetric Solution should be necessary to neutralise 1 gramme of the salt, *B.P.* The *U.S.P.* directs that 1 gramme of the salt be thoroughly carbonised at a temperature not exceeding red heat, and the residue extracted with boiling Distilled Water until the washings cease to react with Methyl Orange T.S. The mixed filtrate or washings should require for complete neutralisation not less than 10·6 c.c. of Semi-normal Volumetric Sulphuric Acid Solution, Methyl Orange T.S. being used as indicator.

Not Official

TARTARUS BORAXATUS. TARTRATE BORICO-POTASSIQUE. SOLUBLE CREAM OF TARTAR.—Soluble Cream of Tartar is a white, amorphous powder soluble in its own weight of Water. The proportions are:—Dan., Norw. and Swed., Potassium Tartrate 2, Borax 1; Dutch and Ger., Potassium Acid Tartrate 5, Borax 2; dissolve the Borax and the Acid Tartrate in Water by the aid of heat, and evaporate to dryness; Ital. (Tartrato Borico-Potassico), proportions not given; Span., Potassium Acid Tartrate 4, Boric Acid 1; Fr. (Borotartrate de Potassium), and Mex. (Tartrato borico-potasico), Potassium Bicarbonate 10, Tartaric Acid 10, Boric Acid 5; Port., with Boric Acid and Potassium Acid Tartrate, but no quantities given.

PRUNI VIRGINIANÆ CORTEX.

VIRGINIAN PRUNE BARK.

WILD CHERRY.—*U.S.P.*

The Bark of *Prunus serotina*, Ehrh.; it is believed to be stronger in the autumn than in the spring, and is required to be collected in the autumn both by *B.P.* and *U.S.P.*

In addition to astringent Tannins, this bark contains **Amygdalin** and **Emulsin**, which on treatment with Water develop Hydrocyanic Acid (in a manner similar to the Cherry-Laurel), to which the sedative effects of its preparations are probably due.

Medicinal Properties.—Sedative. Highly useful in full doses for resultless hacking cough in phthisis and chronic bronchitis. The Syrup is also useful as a flavouring vehicle for nauseous medicines.

Official Preparations.—Syrupus Pruni Virginianæ, and Tinctura Prun Virginianæ.

Not Official.—Fluidextractum Pruni Virginianæ, Infusum Pruni Virginianæ.

Foreign Pharmacopœias.—Official in U.S. Not in the others. U.S. has also an **Infusum** and **Fluid Extract.**

Descriptive Notes.—This bark was formerly supposed to be derived from *Prunus Virginiana*, Mill., whence the official name; it is now officially referred to *Prunus serotina*, Ehrh. The bark varies much in appearance, according to the age of the tree, the young bark being thin, with a reddish external thin papery layer $\frac{1}{20}$ to $\frac{1}{10}$ in. (1·5 to 2·5 mm.) in thickness, with an underlying greenish layer marked with transverse lenticular growths, but in older bark the surface is rough and darker brown and thicker; in both the fracture is short and granular, and the under surface exhibits a minute porous network with small fissures. It has an astringent, bitter taste, and a slight almond flavour when chewed. The young bark is richer in Hydrocyanic Acid, but the *B.P.* does not exclude old bark. Both the *B.P.* and *U.S.P.* state that the bark should be collected in autumn, but the *U.S.P.* describes only the young bark, in curved pieces 3 to 7 cm. long and 0·5 to 4·0 mm. in thickness. Young bark about $\frac{1}{12}$ in. (2 mm.) is the best; when $\frac{1}{8}$ to $\frac{1}{6}$ in. (3 to 4 mm.) in thickness it is likely to be less active. The bark is apt to deteriorate if kept long. The bark of other species of Prunus is sometimes substituted for that of *Prunus serotina*. One of these, described by Finnemore, has a fibrous fracture and gives a darker coloured syrup and is devoid of the characteristic odour and taste. Under the microscope the leading features of the powder are the irregularly shaped stone cells, the brown medullary rays 4 cells broad, large rhomboidal raphides near the stone cells, and smaller ones in the pith; sphæraphides occur in rows in the soft bast and are coloured brown by solution of Caustic Potash. The tissue also contains an abundance of small Starch grains and brown particles of a kind of Tannin which turn black with Ferric salts. In the false bark long bast fibres are present, but no stone cells of irregular shape.

Tests.—Virginian Prune Bark contains from 3 to 4 p.c. of ash, and should not exceed 6 p.c.

Preparations.

SYRUPUS PRUNI VIRGINIANÆ. SYRUP OF VIRGINIAN PRUNE. Percolate 3 of Virginian Prune Bark, in No. 20 powder, with Distilled Water to yield 9; Refined Sugar, in coarse powder, 15; Glycerin, 1¼. Dissolve 15 of Refined Sugar in the liquid, by agitation, without heat; add 1¼ of Glycerin; strain; pour Distilled Water over the strainer to make up to 20.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in U.S., Wild Cherry 15, Sugar 70, Glycerin 15, Water to make 100.

Tests.—Syrup of Virginian Prune has a sp. gr. of 1·300 to 1·310.

TINCTURA PRUNI VIRGINIANÆ. TINCTURE OF VIRGINIAN PRUNE.

Macerate 4 of Virginian Prune Bark, in No. 20 powder, with 7½ of Distilled Water for 24 hours; add 12½ of Alcohol (90 p.c.) and continue the maceration for 7 days.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Tests.—Tincture of Virginian Prune has a sp. gr. of 0·935 to 0·940; contains about 3 p.c. w/v of total solids and about 54 p.c. w/v of Absolute Alcohol.

Not Official.

FLUIDEXTRACTUM PRUNI VIRGINIANÆ.—Wild Cherry, in No. 30 powder, 100, is percolated with a mixture of Glycerin 20, Alcohol (95 p.c.) 20, and Water 60; and then percolation is continued with a mixture of 20 of Alcohol (95 p.c.) and 80 of Water, until the product measures 100. **Dose.**—½ to 1 fl. drm. (1·8 to 3·75 c.c.).—*U.S.P.*

This has been incorporated in the *B.P.C.*, but whereas the *U.S.P.* continue the percolation to produce 100, the *B.P.C.* percolate to exhaustion, reserving the first 90, and concentrate the subsequent weaker percolate to a soft extract and add to the reserved portion.

INFUSUM PRUNI VIRGINIANÆ.—Wild Cherry, in No 20 powder, 4; Glycerin, 5; Water, *q.s.* to make 100. Moisten the powder with 6 of Water, allow it to macerate for 1 hour, pack into a glass percolator, and having put the Glycerin into the receiving bottle gradually pour Water upon the powder, and continue percolation until the product measures 100, and mix well.—*U.S.P.*

This has been incorporated in the *B.P.C.*

PRUNUM.

PRUNES.

The dried ripe Fruits of *Prunus domestica* var. *Juliana.*

Imported from the South of France.

Medicinal Properties.—Mild laxative, nutritious and demulcent. Often used in dietetic treatment of constipation as a laxative.

Official Preparation.—Contained in Confectio Sennæ.

Foreign Pharmacopœias.—Official in Dutch, Pruna; Mex. (Ciruelo de Espana); Port. (Ameixas Passadas); U.S. Not in the others.

Descriptive Notes.—The dried fruits of *Prunus domesticus* var. *Juliana* DC. are official in the *B.P.*, but no special variety of the species is specified in the *U.S.P.* The size given in the *B.P.* is $1\frac{1}{4}$ in. (3 cm.) long, and in the *U.S.P.* 3 to 4 cm. Plums differ in size and shape and in the character of the stone. The stone of the var. *Juliana* is described by Hanbury as $\frac{7}{10}$ to $\frac{8}{10}$ in. long and $\frac{5}{10}$ to $\frac{6}{10}$ in. broad, broadly rounded at the upper end and slightly mucronulate, narrowed and somewhat stalk-like at the lower end and truncate. The ventral suture is broader and thicker than the dorsal. German prunes (Zwetschen or Quetschen) derived from the var. *Pruneauliana*, DC., are sometimes imported. These are rather larger and more elongated and have a thicker skin and a flatter narrower stone, pointed at either end, with the ventral suture more strongly curved than the dorsal, and the fruits are more prone to become covered with a saccharine efflorescence.

Not Official.

PSYLLII SEMEN.

The seeds obtained from *Plantago Psyllium*, L. They are small, about $\frac{1}{12}$ in. long and about half as broad; they are boat-shaped, convex on one side and concave on the other; they are a bright brown in colour, without odour, but have a disagreeable, somewhat acrid taste when fresh, which is removed by Alcohol with which some commercial specimens appear to have been treated. They are closely allied to the Ispaghul Seeds so well known in India, and, like them, are very mucilaginous. They have recently come into more general use in this country in some forms of habitual constipation.

Dose.—A teaspoonful to a tablespoonful of the seeds in half a tumbler of Water at bedtime, or before the principal meal.

PTEROCARPI LIGNUM.

RED SANDERS-WOOD.

B.P.Syn.—Red Sandal-Wood.

(Santalum Rubrum, *U.S.P.*)

The Heart-wood of *Pterocarpus santalinus*, Linn. f.

From Madras and Ceylon. Used solely as a colouring agent.

Official Preparation.—Used in the preparation of Tinctura Lavandulæ Composita.

Foreign Pharmacopœias.—Official in Austr., Jap. and Swed. (Lignum Santali Rubrum); Dutch (Lignum Santalinum); Port. (Sandalo Rubro); Span. (Sandolo Rojo); U.S. (Santalum Rubrum). Not in Fr., Ger., Hung., Ital., Mex., Norw., Russ. or Swiss.

Descriptive Notes.—Red Sandal-Wood being much valued for turning purposes, the logs imported for medicinal use are chiefly derived from the tree stumps or roots. The wood is blackish-brown externally, but of a deep red colour in transverse section, with lighter zones. It is usually met with in retail commerce in the form of splintery raspings of a purplish-red colour. The colouring matter is soluble in 90 p.c. spirit and in caustic alkalis, but is precipitated by acids. The wood has only a faintly astringent taste, and a slight aromatic odour when warmed.

Tests.—It contains about 1 p.c. of ash. It imparts a red colour to Alcohol, but not to Water.

Not Official.

PULSATILLA.

The Herb of *Anemone Pulsatilla*, L., and of *Anemone pratensis*, L., collected soon after flowering.

It should be carefully preserved, and not kept longer than one year.

It contains an unstable body, **Anemone-camphor**, which occurs in trimetric prisms. It splits up into Anemonin and Anemonic Acid.

Medicinal Properties.—Has been used in dysmenorrhœa with various results.

Has been recommended in orchitis and epididymitis, but in experiments at the Lock Hospital it was found to be valueless.—*L.* '89, ii. 216.

Foreign Pharmacopœias.—Official in Fr. Not in the others.

Not Official.

ALCOOLATURE D'ANEMONE PULSATILLE.—Bruised fresh flowers and leaves of Pulsatilla, 1; Alcohol (95 p.c.), by weight, 1. Macerate for 8 days, press and filter.—*Fr.*

TINCTURA PULSATILLÆ.—Carefully dried Herb, 1; Alcohol (60 p.c.), to percolate 10.

Dose.—5 to 30 minims = 0·3 to 1·8 c.c.

A tincture of this strength was included in *B.P.C. Formulary* 1901, and is now incorporated in the *B.P.C.*

Unless the Herb is very finely powdered, it answers better to soak it in warm Water for a day, and then add Alcohol to bring the mixture to the strength of Alcohol (60 p.c.).

It is best prepared from the fresh herb, as in *Fr. Codex*, *see* above.

LIQUOR CAULOPHYLLIN ET PULSATILLÆ, *see* p. 349.

PYRETHRI RADIX.

PYRETHRUM ROOT.

N.O.Syn.—PELLITORY ROOT.

FR., PYRÈTHRE D'AFRIQUE; GER., RÖMISCHE BERTRAMWURZEL;
ITAL., PIRETRO; SPAN., RAIZ DE PELITRE.

The dried Root of *Anacyclus Pyrethrum*, DC.

Collected chiefly in Algeria.

Medicinal Properties.—It is powerfully stimulant to the salivary glands, causing a copious flow of saliva, and, on that account, is used as a masticatory in dryness of the mouth and throat. The Tincture is used on Cotton-Wool for relieving toothache, or when diluted, as a mouth-wash.

Official Preparation.—Tinctura Pyrethri.

Not Official.—Trochisci Pyrethri.

Foreign Pharmacopœias.—Official in Austr., Fr. (Pyrèthre d'Afrique), Mex. (Peritre de Africa), Port. (Pyrethro), Span. (Pelitre), and U.S. Not in the others.

Descriptive Notes.—Pyrethrum root, or Pellitory of Spain, occurs in cylindrical pieces tapering slightly towards either end, unbranched, and having sometimes at the apex a short tuft of soft woolly hairs. It is longitudinally furrowed, is of a dark brown colour and has a short fracture, exhibiting in transverse section a radiate structure, with dark resin cells in the cortex, and medullary rays; the wood is porous and yellow, and the bark is dark brown. It has a characteristic odour, and a slowly pungent and acrid taste, causing a flow of saliva. It has been adulterated with the root of *Corrigiola telephiifolia*, Pourr. which, like Pyrethrum, is a product of Morocco. The root is similar in size, but paler, and exhibits in transverse section a series of horny concentric zones, but no resin ducts.

Tests.—It contains from 4 to 5 p.c. of ash, and the latter figure should not be exceeded.

Preparation.

TINCTURA PYRETHRI. TINCTURE OF PYRETHRUM.

Pyrethrum Root, 4; Alcohol (70 p.c.), *q.s.* to yield 20. (1 in 5)

The Tincture in *B.P.* '85 was made with Rectified Spirit or Alcohol (84 p.c.); *U.S.P.* employ Alcohol (95 p.c.), and *B.P.C.* Alcohol (90 p.c.), subsequently altered to Alcohol (70 p.c.); all are 1 in 5.

Foreign Pharmacopœias.—Official in Fr., Mex. and U.S., 1 in 5. Not in the others.

Tests.—Tincture of Pyrethrum has a sp. gr. of 0·900 to 0·904; it contains from 1·5 to 2 p.c. w/v of total solids and about 68 p.c. w/v of Absolute Alcohol.

Not Official.

TROCHISCI PYRETHRI.—Contain 1 grain in each.—*Throat.*

Not Official.

PYRETHRI FLORES.

Syn.—INSECT POWDER.

The powder of the Flower-heads, obtained in the Caucasus, from *Pyrethrum roseum*, Bieb., and *P. carneum*, Bieb., and in Dalmatia from *Pyrethrum cinerariæfolium*, Trev.

The active principle is an Ether-soluble Resin, not a volatile Oil.

Foreign Pharmacopœias.—Official in Mex. (Peritre del Caucaso). Not in the others.

Keeps away troublesome insects.

Descriptive Notes.—The Persian Insect powder of commerce is derived from the flowers of *Pyrethrum cinerariæfolium*, of which three qualities are sold, named respectively 'closed,' 'half-closed,' and 'open,' the closed being the most effective, if gathered when full grown. In the closed flowers the yellowish-white, lanceolate, acute, hairy phyllaries or outer bracts are incurved; in the half-closed the Flower-heads are frequently more or less deprived of the white ligulate florets; and in the open flowers even the tubular florets may be partially fallen away. The ovary has no pappus, but the calyx forms a short membranous ring with 5 minute teeth, and the fruit has 5 slender rib-like wings. The powdered flowers are characterised by the epidermal papillæ of the ligulate florets being more conical and narrower, and having a thinner apex than those of *Pyrethrum roseum*, the Flower-heads of which are now seldom used; they are distinguished by the red ligulate florets, and the phyllaries with brownish-black margins. As a rule the powder is more active the more abundant the pollen and the smaller the quantity of stem tissue. *See* also *P.J.* (4) iv. pp. 505–507.

This powder has been adulterated with the flowers of other species of *Chrysanthemum*, with White Hellebore, and with chrome yellow and with powdered Sumach leaves. *See Vogl, Pharmacognosie*, pp. 116, 117.

TINCTURA PYRETHRI FLORUM.—The Flower-heads, in powder, 1; Alcohol (60 p.c.), to percolate 4.

Diluted 1 to 10 of Water forms a **lotion** to keep away insects.

This has been incorporated in *B.P.C.*

Not Official.

PYRIDIN.

C_5H_5N, eq. 78·49.

A colourless, volatile liquid, with a powerful and a peculiar odour. Its aqueous solution has a strong alkaline reaction to Litmus. It yields a crystalline deliquescent salt with Hydrochloric Acid.

It is a base obtained from the products of the destructive distillation of bones.

Commercially it always contains Picoline. In its cruder forms it is employed in Germany for 'denaturating' Alcohol, corresponding to 'Methylating' in this country.

Solubility.—It is miscible with Water, Alcohol (90 p.c.), Ether, and the fixed Oils.

Medicinal Properties.—Useful in the treatment of **asthma**; 4 or 5 grammes (62 to 77 grains) are allowed to evaporate from a flat dish in a small room, the patient being exposed to its vapour for about half an hour 3 times a day. Is most beneficial in cardiac dyspnœa, emphysema, and angina pectoris.

If the vapour be inhaled in quantity, it produces headache.

Like Nicotine, it is a good insecticide.

Official in Fr., Mex. and Span.

Tests.—Pyridin has a sp. gr. of about 0·980. It boils at about 116° C. (240·8° F.). When pure it has a strong alkaline reaction towards red Litmus paper, but no action on Phenolphthalein Solution. When added to Copper Sulphate Solution it gives a bluish-green precipitate, soluble in excess to a dark blue liquid similar to that produced by Ammonia. It may be titrated with Normal or Tenth-normal Volumetric Sulphuric or Hydrochloric Acid Solution, using Methyl Orange Solution as an indicator of neutrality. 1 c.c. of Pyridin requires about 12·4 c.c. of Normal Hydrochloric Acid. Each c.c. of Normal Volumetric Hydrochloric Acid Solution represents 0·07849 gramme of absolute Pyridin. The sample should not redden Phenolphthalein Solution, indicating the absence of Ammonia. It should have little or no action on Potassium Permanganate Solution, indicating the absence of readily oxidisable organic impurities; a 0·5 p.c. solution of Pyridin should give a crystalline precipitate, becoming almost semi-solid when mixed with an equal volume of saturated Picric Acid Solution. It should be completely volatilised by heat without leaving any weighable residue.

PYROXYLINUM.

PYROXYLIN.

N.O.Syn.—GOSSYPIUM FULMINANS; FULMI-COTON; LANA COLLODII; COLLOXYLINUM.

FR., FULMI-COTON; GER., KOLLODIUMWOLLE; ITAL., COTONE COLLODIO; SPAN., PIROXILINA.

A white, fibrous substance, having very much the appearance of ordinary cotton, but rapidly burning away with a flash when ignited. It requires to be kept in small quantities in a cool dry place, and away from lights.

Pyroxylin is Dinitrocellulose $C_6H_8(NO_2)_2O_5$, Gun Cotton is Trinitrocellulose $C_6H_7(NO_2)_3O_5$, and is not soluble in any mixture of Alcohol and Ether.

It sometimes decomposes on keeping, with disengagement of Nitrous fumes, and becomes insoluble.

The safest and best plan for its preservation is to moisten the dry material with an equal weight of Methylated Spirit, and preserve in a well-stoppered jar; when required for use it is quickly and easily dried.—*P.J.* '96, ii. 110; *C.D.* '96, ii. 207.

Pyroxylin is officially prepared by nitrating Cotton; 1 of Cotton being immersed in a mixture of 5 of Sulphuric Acid and 5 of Nitric Acid, the mixture being stirred during 3 minutes and the free acid separated by washing with Water till the washings no longer have an acid reaction. The Pyroxylin is drained and dried at a low temperature.

The proportions vary considerably in the different Pharmacopœias (*see* below).

Solubility.—Readily soluble in a mixture of equal volumes of Ether and Alcohol (90 p.c.); also in Acetone.

Different samples of Pyroxylin vary considerably in the extent to which they are soluble.

The use of Acetone as a cheap and efficient solvent for Pyroxylin was suggested in the 16th edition of the *Companion*. A good Pyroxylin will dissolve readily to the extent of 10 p.c. A formula corresponding with the *B.P.* Collodion is Pyroxylin 1, Acetone 48; but this produces an inconveniently thin solution, and a preferable strength is Pyroxylin 3·5, Acetone *q.s.* to make 100. The suggestion for its use has been followed by the *B.P.C.* with certain additions to the formula to make it more closely resemble a well-known proprietary article; it appears under the title **Collodium Acetonum** as follows:—Pyroxylin 5, Oil of Cloves 2, Amyl Acetate 25, Benzol 20, Acetone *q.s.* to produce 100. A more descriptive title for this would have been Collodium Acetonum Compositum, a simple solution in Acetone having been used as Acetone Collodion.

Foreign Pharmacopœias.—Official in Belg. (Pyroxylinum), Dutch, Ger. and Jap., Nitric Acid 400, Sulphuric Acid 1000, Purified Cotton 55; Russ. uses same formula, but Purified Cotton 50; Fr. (Fulmi-coton); Mex. (Piroxilina), Cotton 1, Nitre 20, Sulphuric Acid 30; Port. (Algodao Polvora), and Span. (Pyroxilina), Cotton 1, Nitre 20, Pure Sulphuric Acid (sp. gr. 1·84) 30; Austr., Dan., Hung., Ital., Norw., Swed., Swiss and U.S., no formula given.

Official Preparations.—Used in the preparation of Collodium, and Collodium Vesicans. Of **Collodium,** Collodium Flexile.

Not Official.—Collodium Stypticum, Hæmostatic Collodion, Collodium Anodynum, Celloidin, Photoxylin.

Tests.—Pyroxylin should be readily and completely soluble in a mixture of equal volumes of Ether and Alcohol (90 p.c.), it should be neutral in reaction towards Litmus paper. It should also be soluble in Acetone. When ignited with free access of air it should leave no mineral residue.

Preparations.

COLLODIUM. Collodion.

Dissolve 1 of Pyroxylin in a mixture of Ether 36, and Alcohol (90 p.c.) 12; after a few days decant.

If the Pyroxylin be first soaked in the Alcohol, it quickly dissolves when Ether is added.—*P.J.* '02, i. 138; *C.D.* '02, i. 269.

Mixes with Ether; but when mixed with Water or Alcohol (90 p.c.) the Pyroxylin is thrown out.

Official Preparation.—Collodium Flexile.

Official in Belg. (Pyroxylinum solutum), Pyroxylin 2, Alcohol 5, Ether 40, Castor Oil 3; Dan., Ger., Norw., Russ. and Span. (Collodium), Collodion Wool 4, Alcohol 12, Ether 84; Dutch, Collodion Wool 3, Alcohol 17, Ether 80; Fr. and Mex., Collodion Wool 1, Alcohol 4, Ether 15; Ital. (Collodio), Collodion Wool 1, Alcohol 4, Ether 12; Jap., Collodion Cotton 2, Alcohol 7, Ether 42; U.S., Pyroxylin 4, Alcohol 25, Ether 75; Port., same as Collodio Elastico. All by weight except U.S. Austr., Hung., Swed. and Swiss, no formula given.

Tests.—Collodion has a sp. gr. of 0·770 to 0·780. Upon evaporation it leaves a thin elastic film; when evaporated to dryness and ignited with free access of air it leaves no weighable residue.

COLLODIUM FLEXILE. Flexible Collodion. *N.O.Syn.*—Collodium Elacticum.

Collodion, 12 fl. oz.; Canada Turpentine, ½ oz. (by weight); Castor Oil, ¼ oz. (by weight).

Medicinal Properties.—Chiefly used for coating with a protective film, small clean cuts and abrasions, leech-bites, and fissure of nipple; it has been recommended as an application to erysipelatous surfaces and to burns, and to prevent the pitting of smallpox.

A large number of substances can be dissolved in Collodion to form medicated Collodions. *See* Acidum Salicylicum, Belladonna, Cantharis, Crotonis Oleum, Iodum, Iodoformum.

It does not contract or crack on drying.

Official in Austr., Dutch, Russ. and Swed., Castor Oil 2, Collodion 98; Dan., Castor Oil 1, Collodion 99; Fr., Castor Oil 5, Collodion 95; Ger. and Jap., Castor Oil 1, Turpentine 5, Collodion 94; Hung., Castor Oil 2, Collodion 100; Ital. and Swiss, Castor Oil 3, Collodion 97; Mex., Castor Oil 9, Collodion 90; Norw., Glycerin 1, Collodion 99; Port., Pyroxylin 5, Castor Oil 5, Alcohol (90 p.c.) 20, Ether 70; Span., Castor Oil 10, Collodion 90; U.S., Castor Oil 3, Canada Turpentine 5, Collodion 92. Not in Belg.

Tests.—Collodium Flexile has a sp. gr. of 0·790 to 0·800.

Not Official.

COLLODIUM STYPTICUM.—Dissolve 44 grains of Benzoin in 1 fl. oz. of Absolute Alcohol; filter, and in the filtrate dissolve 1 oz. of Tannic Acid; add Ether (sp. gr. 0·720), 4 fl. oz.; Pyroxylin, 44 grains; allow to stand 3 days, and decant.

B.P.C. Formulary 1901, now incorporated in *B.P.C.* as follows:—
Benzoin 1·50, Pyroxylin 1·50, Tannic Acid 16, Alcohol 16, Purified Ether, *q.s.* to produce 100.—*B.P.C.*
An adaptation of Dr. Richardson's Styptic Colloid.

Official in U.S., Tannic Acid 20, Alcohol 5, Ether 25, Collodion to 100.

HÆMOSTATIC COLLODION (Dr. Pavesi's).—Collodion 100, Carbolic Acid 10, Tannic Acid 5, Benzoic Acid 5; dissolve. Is applied by means of a camel-hair pencil, or by soaking strips of linen in it.

COLLODIUM ANODYNUM (Anodyne Collodion).—Aconitine, 1 grain; Veratrine, 6 grains; Æther Methylatus, 1 fl. oz.; Flexible Collodion, 1 fl. oz.

Collodium Anodynum. *Syn.* Anodyne Colloid.—Aconitine 0·10, Veratrine 0·60, Flexible Collodion, *q.s.* to produe 100.—*B.P.C.*

CELLOIDIN.—A concentrated Collodion occurring in light, yellowish-brown, brittle strips. Is readily soluble in a mixture of Absolute Alcohol and Ether, and the solution is used for embedding histological specimens previous to cutting sections.
A solution of Pyroxylin in Acetone is known under the name **Filmogen.**

PHOTOXYLIN.—A nitrated wood pulp prepared in St. Petersburg. When made into Collodion it is stated to give a tougher film than Pyroxylin on evaporation.—*L.* '87, i. 1253; *B.M.J.* '88, i. 555.

QUASSIÆ LIGNUM.

QUASSIA WOOD.

FR., QUASSIA DE LA JAMAÏQUE; GER., QUASSIAHOLZ; ITAL., QUASSIA;
SPAN., LEÑO DE CUASIA.

The wood of the Trunk and Branches of *Picræna excelsa.*

Imported from Jamaica.
It contains a bitter principle, **Quassin,** sparingly soluble in Water.

Medicinal Properties.—Possesses in a high degree the properties of the simple bitters, without astringency. For contra-indications, and other notes, *see* Calumba. Particularly valuable in dyspepsia due to the debility which succeeds acute disease; containing no Tannin, it is a compatible vehicle for Iron preparations. The infusion is also used as an anthelmintic enema in thread-worm.

A few chips of Quassia or a weak infusion used in the morning bath is a protection against the annoying insects found in our cornfields.—*L.* '84, ii. 306. A strong infusion destroys fleas.—*L.* '95, i. 1018.

Official Preparations.—Infusum Quassiæ, Liquor Quassiæ Concentratus, Tinctura Quassiæ.

Not Official.—Extractum Quassiæ, Fluidextractum Quassiæ, Infusum Quassiæ Concentratum.

Foreign Pharmacopœias.—Official in U.S., same as Brit.; Austr., Belg., Norw., Span., Swed. and Swiss use *Quassia amara*; Dutch, Fr., Ger., Ital., Jap., Mex. (Cuasia), Port. and Russ. use both. Not in Hung. or Dan. Fr. has also Quassin.

Descriptive Notes.—In the *B.P.*, only the wood of the trunk and branches of *Picræna excelsa*, Lindl. (*Picrasma excelsa*, Planch.) is official, but in the *P.G.* and *U.S.P.* that of *Quassia amara*, L., is also official. The wood is met with in commerce in the form of splintery raspings or of coarse chips or transverse slices about an inch in width and 1 to 4 in. long and a line or more in thickness, but the official description refers only to imported billets. These are usually 5 in. or more in diameter. The wood should be nearly white, but is often yellowish or pale buff; it is easily cleft, but not hard. It has a bitter taste, but scarcely any odour. The medullary rays are usually 2 to 3 cells in width, *B.P.* (2 to 5 cells, *P.G.*, 3 to 5, *U.S.P.*), and 10 to 25 cells in height. In tangential section the cells of the medullary rays are seen to contain a series of single prisms of Calcium Oxalate.

The wood of *Quassia amara* (Surinam Quassia) has a deeper yellow colour, is harder and heavier, and the medullary rays are only 1 to 2 cells broad, and 5 to 20 cells high. The *P.G.* states that the wood is free from crystals of Calcium Oxalate, Vogl that there are no crystals in the wood, but sphæraphides in the middle bark. Quassia that has been exhausted for the preparation of agricultural insecticide has been offered in commerce; in this case the chips have dark lines of fungal hyphæ present, and possess hardly any bitterness.

Tests.—Quassia contains about 3 p.c. of ash, and 4 p.c. should not be exceeded.

Preparations.

INFUSUM QUASSIÆ. Infusion of Quassia.

Quassia Wood, finely rasped, 88 grains; Distilled Water, cold, 20 fl. oz. Macerate 15 minutes, and strain. (about 1 in 100)

Dose.—$\frac{1}{2}$ to 1 fl. oz. = 14·2 to 28·4 c.c.

Foreign Pharmacopœias.—Official in Fr. (Quassia Amara), 1 in 200; Ital., 1 in 20; Span. (Tinct. Acuosa de Quassia Amarga), 1 in 100. Not in the others.

A **solid extract** is official in the following: Austr. and Jap., first with cold Water, subsequently boiling; Fr. (Quassia Amara), Belg., Mex., Port. and U.S. use cold Water; Swiss uses boiling Water; Mex. and U.S. have also a **fluid extract.**

LIQUOR QUASSIÆ CONCENTRATUS. Concentrated Solution of Quassia.

2 of Quassia Wood, in No. 40 powder, percolated with Alcohol (20 p.c.), to produce 20. (1 in 10)

Dose.—$\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c.

Tests.—Concentrated Quassia Solution has a sp. gr. of 0·975 to 0·980; contains about 0·5 p.c. w/v of total solids and about 18 p.c. w/v of Absolute Alcohol.

TINCTURA QUASSIÆ. Tincture of Quassia.

1 of Quassia Wood, rasped, macerated with 10 of Alcohol (45 p.c.). (1 in 10)

Dose.—$\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Belg., Dutch, Fr. and Jap., 1 and 5; Mex., Swiss and U.S., 1 in 5. Not in the others. All by weight except U.S.

Tests.—Tincture of Quassia has a sp. gr. of 0·945 to 0·949; contains about 0·5 p.c. w/v of total solids and about 45 p.c. w/v of Absolute Alcohol. 0·016 p.c. w/v of Quassin has been suggested as a standard.

Not Official.

EXTRACTUM QUASSIÆ.—Quassia 16 is macerated with 8 of Water for 12 hours, exhausted by percolation, partly evaporated, filtered, and further evaporated until of a consistence for forming pills.—*B.P.* 1885.
This has been incorporated in the *B.P.C.*

FLUIDEXTRACTUM QUASSIÆ.—100 of Quassia, in No. 40 powder, is exhausted with a mixture of Alcohol (95 p.c.) 30 and Water 60, the first 90 of percolate is reserved and the remainder evaporated to a soft extract, which is dissolved in the reserved portion, and enough menstruum added to make 100.—*U.S.P.*

INFUSUM QUASSIÆ CONCENTRATUM.—Quassia Wood, in No. 20 powder, 7·5; Alcohol (90 p.c.), 20; Dilute Chloroform Water (1 in 100), *q.s.* to make 100. Prepare by repercolation.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.—*Farr* and *Wright*, *P.J.*, '06, i. 165 and '07, i. 622; *C.D.* '06, i. 252; *Y.B.P.*, 1907, 249.
This appears in the *B.P.C.*, employing 5 of Quassia.

Not Official.

QUEBRACHO.

The Bark of *Aspidosperma Quebracho*, Schlecht., obtained from the Argentine Republic and Brazil (*Quebracho blanco*).

Medicinal Properties.—Was used rather extensively at one time for asthma and cardiac dyspnœa, but is now seldom prescribed.

Foreign Pharmacopœias.—Official in Austr., Mex., Span. and Swiss. Not in the others.

Tinctura Quebracho, 1 in 5 of Alcohol (60 p.c.); dose, ½ to 1 fl. drm. = 1·8 to 3·6 c.c.
This has been incorporated in the *B.P.C.*

Official in Mex., Span. and Swiss.

Fluid Extract (1 in 1) is official in Austr., and Extracto de Quebracho is official in Mex. and Span.
The following alkaloids and salts can be obtained: Aspidospermine Cryst. and Sulphate (Fraude); Aspidosamine and Hydrochloride (Hesse); Quebrachine Cryst. and Hydrochloride (Hesse); dose, ¾ to 1½ grains; Quebrachamine and Sulphate (Hesse); Hypoquebrachine and Hydrochloride (Hesse).
Quebrachine is more active and more poisonous than Aspidospermine; it has greater antithermic properties.—*L.* '86, i. 804.

Not Official.

QUERCUS CORTEX.

OAK BARK.

The dried Bark of the small Branches and young Stems of *Quercus Robur*, L., collected in spring from trees growing in Britain.

Medicinal Properties.—A local astringent. May be used topically in cases in which Tannic Acid is indicated, such as relaxed throat or tenderness of the gums, leucorrhœa, gonorrhœa, etc.

Dose.—Of the **powder**, 30 to 120 grains = 2 to 8 grammes. Of a **Decoction** (1 to 16), 1 to 2 fl. oz. = 28·4 to 56·8 c.c.

Foreign Pharmacopœias.—Official in Austr., Fr. (Chêne); Ger., Hung.; Mex. (Encina); Norw.; Port. (Corvalho); Russ., Swiss, U.S. (Quercus alba).

QUILLAIÆ CORTEX.

QUILLAIA BARK.

B.P.Syn.—Panama Bark. *N.O.Syn.*—Soap Bark.

Fr., Écorce de Panama; Ger., Seifenrinde; Ital., Quillaja;
Span., Corteza de Quillaya.

The inner part of the Bark of *Quillaja Saponaria*, Molina.

Imported from Chili and Peru.

Medicinal Properties.—Has been strongly recommended as an expectorant; but its use requires caution, for it is a powerful irritant.

The powder is excessively irritating to the air passages.

It has been found to possess properties allied to Senega, but it contains the two poisonous glucosides 'Quillaic Acid' and 'Sapotoxin' in much greater quantity than they exist in Senega.

Prescribing Notes.—*The Tincture is used to emulsify oils and fats; it requires from 1 to 3 of Tincture for 2 of Oil, depending on the character of the latter. Saponin is used for the same purpose.*

Not Official.—Saponin (Quillaic Acid).

Official Preparation.—Tinctura Quillaiæ. Used in the preparation of Liquor Picis Carbonis.

Foreign Pharmacopœias.—Official in Austr., Dan. (Quillaja); Fr. (Écorce de Panama); Ger. (Quillaia); Jap., Mex. (Quillaya); Swiss and U.S. (Quillaja). Not in the others. U.S. has a Fluid extract.

Tests.—Quillaia Bark contains from 11 to 12 p.c. of ash.

Preparation.

TINCTURA QUILLAIÆ. Tincture of Quillaia.

1 of Quillaia Bark, in No. 20 powder, percolated with Alcohol (60 p.c.), to yield 20. (1 in 20)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Fr. (Teinture de Panama), and Mex. 1 in 5 (Alcohol 80 p.c.); Swiss, Quillaia 1, Alcohol 5, Water 5; U.S., boil 20 of Quillaja with 80 of Water for 15 minutes, strain and wash the residue with boiling Water; evaporate to 60, and when cold add 35 of Alcohol (95 p.c.), filter, and make up with Water to 100.

Tests.—Quillaia Bark Tincture has a sp. gr. of 0·920 to 0·925; it contains about 1·25 p.c. w/v of total solids and about 58 p.c. w/v of Absolute Alcohol.

Not Official.

SAPONIN (Quillain, Quillaic Acid).—A white, amorphous powder, soluble in Water and in Alcohol (90 p.c.); insoluble in Ether and in Chloroform.

Not Official.

QUININA.

$C_{20}H_{24}N_2O_2$, $3H_2O$, eq. 375·48.

Fr., Hydrate de Quinine; Ger., Chinin; Ital., Chinina;
Span., Quinina.

A white, soft, granular powder, slightly damp from adherent moisture, easily soluble in Ether or dilute mineral acids.

When separated from its solutions by shaking out with Ether or Chloroform and evaporating to dryness, it still retains a little Water, dried off with difficulty in a water-bath; for determination purposes it should be heated to 120° C. (250° F.).

It should be kept in well-stoppered glass bottles of a dark amber tint. When freshly precipitated from solutions of its salt it contains 3 molecules of Water of crystallisation as a Trihydrate.

Solubility.—Very sparingly in Water; 1 in 1 of Alcohol (90 p.c.); 1 in 3 of Chloroform; 1 in 4 of Ether.

Foreign Pharmacopœias.—Official in Dutch, Fr., Hung., Mex., Port., Span., Swed. and U.S.

Tests.—Quinine fuses when heated to 57° C. (134·6° F.) to a gummy-looking mass. It loses 2 molecules of Water of crystallisation, equivalent to 9·2 p.c. when dried over Sulphuric Acid or heated at a temperature of 100° C. (212° F.), the remaining molecule of Water of crystallisation being driven off at 125° C. (257° F.), the total loss of Water being equivalent to 14·2 p.c. Quinine which has been rendered anhydrous by heating till constant in weight at a temperature of 125° C. (257° F.), melts at 175° C. (347° F.). The aqueous solution is alkaline in reaction towards moistened red Litmus paper, and is lævogyrate. The alkaloid dissolves readily in diluted acids, its solution in diluted Sulphuric Acid exhibiting a strong fluorescence, the Hydrochloride and other haloid salts of Quinine exhibiting little fluorescence until excess of Sulphuric Acid is added. The fluorescence of solutions of the Sulphate is to a large extent destroyed by Hydrochloric Acid or by the presence of Chlorides. If just sufficient Sulphuric Acid be used to effect solution, and to this liquid be added 2 c.c. of Chlorine or Bromine Water, the subsequent addition of Ammonia Water produces an emerald-green coloration. If the alkaloid be dissolved in diluted Alcohol and sufficient diluted Sulphuric Acid be added to convert it into a solution of Quinine Acid Sulphate and the liquid be then heated to boiling point, and a saturated Iodine Solution be added slowly and cautiously, the liquid on cooling deposits bronze-green crystals of Quinine Iodo-sulphate which are insoluble in cold Water. The acidified solution of the alkaloid is precipitated by Potassium Mercuric Iodide (Mayer's) Solution, and by Iodo-potassium Iodide (Wagner's) Solution. When separated from its solutions by shaking out with Ether or Chloroform and evaporated to dryness it still retains a little Water, which is dried off with difficulty on a water-bath. For determination purposes it should be heated to 120° C. (250° F.) before weighing. Quinine in the free state may be determined by titration with Tenth-normal Volumetric Sulphuric Acid Solution, using Cochineal, Methyl Orange or Hæmatoxylin Solution as an indicator of neutrality. The behaviour of Quinine to these indicators of neutrality is somewhat anomalous; the point of neutrality when Cochineal or Hæmatoxylin is used as an indicator is reached when sufficient Acid has been added to convert the Quinine into the ordinary Quinine Sulphate $(C_{20}H_{24}N_2O_2)_2\ H_2SO_4$. That is to say that 1 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution is equivalent to 0·037848 gramme of Quinine Trihydrate or 0·032184 gramme of anhydrous Quinine. In the case of Methyl Orange the end reaction only occurs with the formation of the readily soluble Acid Sulphate $(C_{20}H_{24}N_2O_2H_2SO_4)$, 1 c.c. of Tenth-normal Volumetric Hydrochloric Acid corresponding to 0·018774 gramme of Quinine Trihydrate or 0·016092 gramme of anhydrous Quinine. The use of Hydrochloric Acid to a large extent prevents the troublesome fluorescence yielded by the Sulphuric Acid Solution. Quinine may be distinguished from Cinchonine and Cinchonidine by the intensely red coloration, slowly changing to blue and finally to green, which is produced when 1 drop of Copper Sulphate and a drop of Hydrogen Peroxide Solution is added to a solution of 0·2 of a gramme of the alkaloid in 20 c.c. of Water containing 1 c.c. of diluted Sulphuric Acid; Quinine and Quinidine both yield a reaction with this test. The absence of Cinchonine and Cinchonidine is shown by the fact that a solution of 1 gramme of the alkaloid in a slightly warm mixture of 6 c.c. of Absolute Alcohol and 3 c.c. of Ether remains clear on cooling. When treated with Sulphuric Acid it should not acquire more than a faintly yellowish colour, indicating the absence or limit of readily carbonisable organic impurities, nor should it produce a red colour on the addition of Nitric Acid, indicating the absence of Morphine. When heated with Potassium Hydroxide Solution it should not evolve an odour of Ammonia, nor should the issuing vapour have an alkaline reaction towards moistened red Litmus paper. When dried till constant in weight at 125° C. (257° F.), it should not lose more than 14·2 p.c. When ignited with free access of air it should leave no weighable residue.

Quinine should be free from the other Cinchona alkaloids, and when dissolved in Alcohol and carefully neutralised with Normal Volumetric Sulphuric Acid Solution, using Hæmatoxylin Solution as an indicator of neutrality, and evaporated to dryness, the residue should respond to the official test for absence of Cinchonidine, Cinchonine, Quinidine, Cupreine and amorphous alkaloids given under Quininæ Sulphas. The *U.S.P.* states that 2 grammes of Quinine, which have been previously dried at 50° C. (122° F.) for 2 hours in a porcelain dish, dissolved in 20 c.c. of Alcohol (94·9 p.c.) and neutralised exactly with Sulphuric Acid, using Hæmatoxylin Solution as an indicator of neutrality, when evaporated to dryness on a water-bath yields a residue which answers the *U.S.P.* test for absence of other Cinchona alkaloids given under Quininæ Sulphas. The alkaloid is not official in the German Pharmacopœia.

The official Salts of Quinine (**Hydrochlorides** and **Sulphate**) are given under separate headings.

INJECTIO QUININÆ HYPODERMICA.—Quinine Hydrate, 76 grains; Lactic Acid, 27 minims, or a sufficiency; Distilled Water, a sufficiency; rub the Quinine with 6 fl. drm. of the Water, and add the Lactic Acid so as to dissolve the Quinine, and form a solution neutral or only faintly acid to Litmus paper, and make the measure up to 1 fl. oz. with Distilled Water.

More recently the Acid Hydrobromide has been used for this purpose, *see* p. 986.

OLEATUM QUININÆ.—Quinine, 1; Oleic Acid (by weight), 3; rub the Quinine with a small quantity of the Oleic Acid in a warmed mortar to form a smooth paste, add the remainder of the Oleic Acid, previously warmed, and stir frequently until the Quinine is dissolved.—*U.S.P.*

This has been incorporated in the *B.P.C.* under the title **Oleinatum Quininæ** with the *syn.* Oleatum Quininæ.

QUININE ARSENATE ($C_{20}H_{24}N_2O_2.H_3AsO_4.2H_2O$, eq. 498·62).—Silky needles, sparingly soluble in cold Water, soluble in boiling Water. It may be prepared by the interaction of equivalent quantities of Quinine Hydrochloride and Mono-potassium Arsenate. It contains 64·5 p.c. of anhydrous Quinine, 28·3 p.c. of Arsenic Acid, and 7·2 p.c. of Water of crystallisation.

Dose.—$\frac{1}{10}$ grain = 0·0065 gramme.

Tests.—Quinine Arsenate dissolves sparingly in cold Water. The solution affords on the addition of a small quantity of Bromine Water, followed by a slight excess of Ammonia Solution an emerald-green coloration. The saturated aqueous solution affords a reddish-brown precipitate on the addition of Silver Ammonio-Nitrate Solution. 0·5 gramme of the salt when ignited with free access of air should leave no weighable residue.

QUININE ARSENATE BASIC ($(C_{20}H_{24}N_2O_2)_2H_3AsO_4.\ 8H_2O$, eq. 927·74.)—Colourless prismatic crystals, very slightly soluble in cold Water, more readily soluble in hot Water. It contains 69·4 p.c. of anhydrous Quinine, 15·2 p.c. of Arsenic Acid and 15·4 p.c. of Water of crystallisation.

Tests.—Basic Quinine Arsenate dissolves only sparingly in cold Water. The solution yields with Silver Ammonio-Nitrate Solution a reddish-brown precipitate, and when acidified with Hydrochloric Acid and warmed to about

80° C. (176° F.) it yields with Hydrogen Sulphide a yellow precipitate, soluble in Ammonium Carbonate Solution or in Sodium Hydroxide Solution. The saturated aqueous solution when treated with a small quantity of Bromine Water yields on the addition of Ammonia Solution in slight excess an emerald-green coloration. 0·5 gramme of the salt when ignited with free access of air should leave no weighable residue.

QUININÆ CARBOLAS.—The crystalline salt contains 77 p.c. of anhydrous Quinine. For extemporaneous preparations, the alkaloid may be used, and the best proportions are: Quinine, 4; Carbolic Acid, 1; melt, and cool.

Dose.—2 grains = 0·13 gramme for diarrhœa.

Quininæ Sulphocarbolas.—A yellowish-white powder, prepared by the interaction of Quinine Sulphate and Barium Paraphenolsulphonate. Dose, 1 to 5 grains = 0·06 to 0·32 gramme.

QUININÆ CITRAS.—Crystallises in delicate needles.

Various formulas are given for this salt, QCi; Q_2Ci; $Q_2Ci.7H_2O$; but the commercial salt corresponds more closely with $(C_{20}H_{24}N_2O_2)_2H_3C_6H_5O_7.3H_2O$, eq. 887·94, containing 72·5 p.c. of Quinine.

Solubility.—1 in 1200 of Water; slightly in Chloroform.

QUININÆ CITRAS EFFERVESCENS.—Contains 2 p.c. of Quinine Citrate in combination with Effervescent Sodium Citro-Tartrate, *B.P.—B.P.C.*

Official in Mex.

QUININÆ ETHYLCARBONAS (Euquinine, Euchinine).—Light, odourless, almost tasteless, silky, crystalline needles, sparingly soluble in Water; soluble in Alcohol, in Ether and in Chloroform. Produced by the action of Ethyl-chlor-carbonate on Quinine.

Antipyretic and analgesic. Recommended as a substitute for Quinine, owing to its tastelessness, and found useful in the hectic fever of tuberculosis, in whooping-cough, influenza, and malaria.—*B.M.J.E.* '96, ii. 104; '99, i. 100; '01, ii. 16; *B.M.J.* '97, ii. 1734; *L.* '97, ii. 728.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Official in Jap. and Swiss.

Tests.—Quinine Ethylcarbonas melts at about 95° C. (203° F.). It dissolves in a solution of Sulphuric or Nitric Acid, producing solutions having a strong green fluorescence. When treated with Sulphuric or Hydrochloric Acid and a little Chlorine Water it yields on the addition of Ammonia Solution in slight excess an emerald-green coloration; when its solution in Sulphuric Acid is mixed with Solution of Iodine it does not yield crystals of the Iodo-sulphate. When warmed with Sodium Hydroxide Solution, cooled, and sufficient Iodine Solution added to form a slight but distinct excess of the solution, again warmed it yields an odour of Iodoform. When dissolved in diluted Nitric Acid Solution it should yield no turbidity or precipitate with Hydrogen Sulphide Solution nor with Barium Chloride Solution. When heated with free access of air it should leave no weighable residue.

Under the name of **Aristochin,** a Di-Quinine Carbonic Ester, in the form of an odourless, almost tasteless powder, has been introduced. As an analgesic ¼ gramme = 3¾ grains, or more generally ½ gramme = 7½ grains, given 3 times, 3, 2 and 1 hour before the pain is expected to begin. In doses of ½ gramme = 7½ grains as an antipyretic in malaria.—*B.M.J.E.* '04, i. 55.

QUININÆ ET FERRI CHLORIDUM.—In brown scales or in a dark brown powder, very soluble in Water. Used as a hæmostatic.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

QUININÆ FLUORIDUM.—A white, or whitish, amorphous powder.

Dose.—1 to 2 grains = 0·06 to 0·13 gramme.

QUININE FORMATES.—There are two Formates of Quinine, the neutral Quinine Formate, prepared by dissolving the requisite amount of Quinine in solution of Formic Acid and allowing to crystallise, and the basic Quinine

Formate, prepared by neutralising Quinine with the calculated amount of Formic Acid.

NEUTRAL QUININE FORMATE $C_{20}H_{24}N_2O_2(H_2CO_2)_2$, eq. 413·18.—White, shining needles, readily soluble in Water. The salt is very unstable; it contains 77·88 p.c. of alkaloid.

Tests.—Neutral Quinine Formate melts at 95° C. (203° F.). It loses Formic Acid at 50° C. (122° F.). It dissolves in Water and the aqueous solution yields when acidified with diluted Sulphuric Acid and treated with a small quantity of Chlorine or Bromine Water and an excess of Ammonia Solution an emerald-green coloration. The salt should leave no weighable residue when ignited with free access of air.

BASIC QUININE FORMATE ($C_{20}H_{24}N_2O_2$, H_2CO_2, eq. 367·51).—Forms white, silky needles, containing about 87·56 p.c. of Quinine. It is moderately soluble in Water, more so in boiling Water, readily soluble in Alcohol (90 p.c.) and in Chloroform, sparingly soluble in Ether, and insoluble in fixed Oils.

Tests.—Basic Quinine Formate melts at about 109° C. (228·2° F.). The *B.P.C.* give the m.p. as 32° C., but this is apparently an error for 132° C. The m.p. given by Lacroix (*Jour. Pharm. Chem.* [6] 22, 90) is 132° C. (269·6° F.), but this was subsequently corrected by him to 109° C. (228·2° F.). When dissolved in Water and acidified with diluted Sulphuric Acid the solution yields on the addition of a little Chlorine or Bromine Water, and subsequent addition of a slight excess of Ammonia Solution, an emerald-green coloration. Its aqueous solutions are strongly lævorotatory. The optical rotation is −144·2°. Lacroix originally gave the optical rotation as −141·1°, and this is the figure which has been adopted by the *B.P.C.*, it was subsequently altered by Lacroix to −144·2°. It should leave no weighable residue when ignited with free access of air.

QUININÆ GLYCEROPHOSPHAS.—There are two Quinine Glycerophosphates, one basic and one neutral.

The basic salt $(C_{20}H_{24}N_2O_2)_2$ $C_3H_7O_3H_2PO_4$, $5H_2O$, eq. 903·89 is the one in general use. In slender, white, crystalline needles, slightly soluble in Water, 1 in 200 of Alcohol (90 p.c.).

Useful chiefly in neuralgia and in convalescence.

Dose.—2 to 8 grains = 0·13 to 0·52 gramme.

Official in Fr. (Glycerophosphate Basique de Quinine).

Kineurine is stated to contain this salt.

Tests.—Basic Quinine Glycerophosphate loses its Water of crystallisation, equivalent to 9·8 p.c., at 100° C. (212° F.), and is converted into an anhydrous salt. It melts at about 145° C. (293° F.). The aqueous solution affords with Potassium Hydroxide Solution a white precipitate soluble in Ether. The filtrate from the precipitate evaporated to dryness and ignited with the addition of a little Potassium Carbonate and Potassium Nitrate yields a residue, which, when dissolved in Water and acidified with Nitric Acid, affords with Ammonium Molybdate Solution a yellow precipitate soluble in Ammonia and reprecipitated as a white precipitate on the addition of Magnesium Ammonio-sulphate Solution. When dissolved in Water and acidified with Sulphuric Acid it affords, on the addition of a small quantity of Chlorine or Bromine Water and the subsequent addition of Ammonia Solution in slight excess, an emerald-green coloration. When shaken with Absolute Alcohol, filtered, and the alcoholic solution evaporated to dryness it should leave no weighable residue. The aqueous solution should afford no immediate precipitate with Ammonium Molybdate Solution.

QUININÆ HYDRIODIDUM ($C_{20}H_{24}N_2O_2HI$, eq. 448·74).—The neutral salt has about the same solubility in Water as the Sulphate, and dissolves freely in Alcohol and Ether. It is generally found as a yellowish, amorphous powder.

SYRUPUS QUININÆ HYDRIODIDI.—Acid Hydriodide of Quinine, 4 scruples; Syrup, to 10 fl. oz. Triturate the Quinine in a mortar and add the Syrup gradually, stirring constantly to dissolve the salt.—*Pharm. Form.*

Syrupus Quininæ Hydriodidi. *Syn.* Syrup of Iodide of Quinine.—Quinine Hydriodide, 2; Distilled Water, 2; Syrup of Citric Acid, *q.s.* to produce 100.—*B.P.C.*

QUININÆ HYDRIODIDUM ACIDUM ($C_{20}H_{24}N_2O_2.2HI.5H_2O$, eq. 665·04).—Crystallises in large laminæ of a fine yellow colour and is soluble 1 in 20 of Water.

Both have been given in chronic rheumatism and tuberculosis.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

QUININÆ HYDROBROMIDUM.—Colourless, silky crystals, neutral or slightly alkaline.

It should be kept in well-stoppered glass bottles of a dark amber tint.

It is given (*P.J.* (3) v. 303) with H_2O, and soluble 1 in 5. *Fr. Codex* with H_2O, soluble 1 in 44·5. Our stock (May 1893) corresponded with $C_{20}H_{24}N_2O_2.HBr.H_2O$, containing 76·5 p.c. of Quinine, and soluble about 1 in 55 of Water; after drying at 125° C., its original moisture was again absorbed rapidly from the atmosphere. *U.S.* (1882) gave the formula with $2H_2O$, and solubility 1 in 16 of Water; *U.S.P.* now gives it with H_2O, and soluble 1 in 40 of Water at 25° C. (77° F.).

The **Hydrobromide** is preferred (*Pr.* lxxiii. 682) for oral administration in malaria; and where rapid action is required, hypodermic or intravenous injection may be employed.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

Official in Belg., Fr., Mex., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—Quinine Hydrobromidum loses its Water of crystallisation, equivalent to 4·25 p.c., when heated to 100° C. (212° F.), and at a higher temperature 152° C. (305·6° F.) it commences to fuse, forming a syrupy liquid. It dissolves in Water, forming a solution which is neutral or but faintly alkaline in reaction towards red Litmus paper. This solution when acidified with dilute Sulphuric Acid assumes a strong blue fluorescence, and when treated with a small quantity of Bromine Water and an excess of Ammonia Solution an emerald-green colour is produced. The aqueous solution treated with Ammonia Solution affords a white precipitate soluble in an excess of the reagent, and the precipitate is also soluble in Ether. The addition of Potassium or Sodium Hydroxide Solution to an aqueous solution of the salt affords a white precipitate, and if this precipitate be removed by shaking with Ether the aqueous liquid when treated with a few drops of Chlorine Water assumes a yellowish or reddish colour, and when shaken with Chloroform the colour passes into the chloroformic solution. A portion of the aqueous liquid after separation of the Quinine when acidified with diluted Nitric Acid affords with Silver Nitrate Solution a yellowish curdy precipitate insoluble in Nitric Acid, practically insoluble in Ammonia Solution, readily soluble in Potassium Cyanide Solution.

The more generally occurring impurities are excess of moisture, readily charred organic impurities, Sulphates, and other Cinchona alkaloids. The salt should not lose more than 4·25 p.c. of moisture when dried till constant in weight at 100° C. (212° F.). A solution of the salt in concentrated Sulphuric Acid should not be coloured more than a pale yellow; no red coloration should be produced on treating the salt with Nitric Acid. An aqueous solution of the salt should not assume more than a faint turbidity on the addition of Barium Chloride Solution.

It may be distinguished from Morphine by the Nitric Acid test described above, Morphine producing a red coloration with Nitric Acid. A confirmatory reaction for Morphine is to add 1 dgm. of Quinine Hydrobromide to 5 c.c. of a saturated Potassium Ferricyanide Solution, 25 c.c. of Water, 15 drops of Ferric Chloride T.S., and 5 c.c. of diluted Hydrochloric Acid, no blue coloration should be developed in 5 minutes. The absence of other Cinchona alkaloids may be assured by the *U.S.P.* test given under Quininæ Sulphas. 3 grammes of the Hydrobromide which has been previously dried at 50° C. (122° F.) for 2 hours should be dissolved in 30 c.c. of hot Water, 1·5 gramme of crystallised Sodium Sulphate gradually added and the liquid evaporated to dryness on a water-bath; it then being examined by the test there described.

SYRUP QUININÆ HYDROBROMIDI.—Quinine Hydrobromide, 80 grains; Dilute Hydrobromic Acid, 3 fl. drm.; Syrup of Orange (*B.P.* 1898), to make 10 fl. oz.—*A.Ph.F.*

Quinine Acid Hydrobromide, 2; Syrup of Orange, *q.s.* to produce 100.—*B.P.C.*

QUININÆ HYDROBROMIDUM ACIDUM ($C_{20}H_{24}N_2O_2.2HBr.3H_2O$, eq. 536·18).—Colourless crystals, containing 60 p.c. of Quinine.

Solubility.—1 in 6 of Water.

3 grains dissolved in 20 minims of warm Distilled Water injected into the carefully asepticised upper arm, in the treatment of chronic malarial fever. 6 injections on alternate days are usually required in a serious case.—*B.M.J.* '99, ii. 85; '02, i. 201, 439; '03, i. 848; *Y.B.P.* '02, 203.

Solutions of the **Acid Hyrobromide** and **Acid Hydrochloride** (which latter salt was made official in the British Pharmacopœia 1898) are put up in hermetically sealed glass capsules, and may be obtained in white or in dark amber-tinted glass. Each c.c. contains 3 grains of the Acid Hydrobromide or 7½ grains of the Acid Hydrochloride.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme. Best administered hypodermically.

Official in Fr. and Mex., Bromhydrate de Quinine Neutre.

Tests.—Quinine Acid Hydrobromide loses its Water of crystallisation, equivalent to 10·0 p.c., when heated. It dissolves readily in Water, forming a clear solution which possesses an acid reaction towards blue Litmus paper. The aqueous solution yields on the addition of Ammonia Solution a white precipitate. When acidified with diluted Sulphuric Acid Solution and mixed with a small quantity of Bromine Water it yields on the addition of Ammonia Solution in slight excess an emerald-green coloration. When acidified with diluted Nitric Acid Solution it yields with Silver Nitrate Solution a yellow curdy precipitate insoluble in Nitric Acid, practically insoluble in Ammonia Solution, readily soluble in Potassium Cyanide Solution. The salt loses 10·0 p.c. when dried till constant in weight. It should yield no turbidity on the addition of diluted Sulphuric Acid. When ignited with free access of air it should leave no weighable residue. It should be free from other Cinchona alkaloids when neutralised and examined by the tests described under Quininæ Hydrobromidum, and using a correspondingly increased amount of Sodium Sulphate.

QUININÆ HYDROCHLORO-SULPHAS.—Glistening, white, silky, crystalline needles, or as a white, or yellowish-white, amorphous powder. Soluble 1 in 2 of Water; 1 in 7 of Alcohol (90 p.c.). On account of its greater solubility in Water, it has been recommended for hypodermic use.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

Official in Mex. and Span.; Mex. has also solution for hypodermic injection, 1 in 2.

QUININÆ HYPOPHOSPHIS ($C_{20}H_{24}N_2O_2.H_3PO_2$, eq. 387·40).—Generally supplied as an amorphous powder, but it can be obtained in light, colourless, prismatic crystals.

Solubility.—1 in 250 of Water; 1 in 40 of Alcohol (90 p.c.).

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

QUININÆ IODO-HYDRIODIDUM.—A reddish-brown, amorphous powder, insoluble in Water and in Alcohol; it is obtained by adding Iodo-Potassium Iodide Solution to a solution of a Quinine salt. Has been employed in syphilitic diseases.

Dose.—1 to 4 grains = 0·06 to 0·26 gramme.

QUININÆ LACTAS ($C_{20}H_{24}N_2O_2.C_3H_6O_3$, eq. 411·21).—Colourless prismatic needles, or a white crystalline powder; soluble about 1 in 6 of Water, but there is much doubt about its solubility.

Used chiefly by hypodermic injection in 10 p.c. solution.

Official in Mex.

QUININÆ PHOSPHAS. In light, white, acicular crystals. It is stated (*P.J.* (3) xxiii. 234) that the English-made salt has the formula $3C_{20}H_{24}N_2O_2.2H_3PO_4.6H_2O$, and the German salt $2C_{20}H_{24}N_2O_2.H_3PO_4.4H_2O$; the former containing 76 p.c. and the latter 79 p.c. of Quinine.

Solubility.—1 in 420 of Water; 1 in 110 of Alcohol (90 p.c.).

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

QUININÆ SALICYLAS $(C_{20}H_{24}N_2O_2.C_7H_6O_3)_2$, H_2O, eq. 935·58.—White, crystalline, silky needles, prepared by the interaction of Quinine Sulphate with Sodium Salicylate. It is practically anhydrous, and contains 70 p.c. of Quinine.

It should be kept in well-stoppered glass bottles of a dark amber tint and exposed as little as possible to the air. The *U.S.P.* gives the formula of the salt with half a molecule of Water of crystallisation.

Solubility.—1 in 630 of Water; 1 in 24 of Alcohol (90 p.c.); 1 in 25 of Chloroform.

In 1-drm. doses of the liquor every 3 or 4 hours for a day or two, combined with a spray for the post-nasal space, is useful (*B.M.J.* '05, ii. 252, 1181) in preventing acute middle-ear suppuration from becoming chronic.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.
Given in capsules, cachets, or pills.

Official in Mex., Russ., Span. and U.S.

Tests.—Quinine Salicylate when heated commences to melt at 183° C. (361·4° F.). It dissolves slightly in Water, forming a solution which possesses an alkaline reaction towards red Litmus paper, and which yields on the addition of Ferric Chloride T.S. a violet coloration. The saturated aqueous solution when mixed with a small quantity of Chlorine or Bromine Water yields on the addition of Ammonia Solution in slight excess an emerald-green coloration. Sulphuric Acid containing one-fifth of its volume of Formaldehyde Solution yields a pink coloration. When heated till constant in weight at 100° C. (212° F.) the *U.S.P.* requires that the salt should lose not more than 2·0 p.c., indicating the absence of an excess of Water. When dissolved in Water acidified with a few drops of Nitric Acid and separated from the liberated Salicylic Acid, the filtrate should yield no marked turbidity on the addition of Silver Nitrate Solution, nor with Barium Chloride Solution, indicating the absence of more than slight traces of Chlorides and Sulphates. The alkaloid separated by mixing 2 grammes of the salt with 10 c.c. of Distilled Water adding Ammonia Solution in slight excess and extracting with 3 successive quantities each of 25 c.c., 20 c.c. and 10 c.c. of Ether, evaporating the ethereal solution to dryness on a water-bath, and dissolving the residue in Alcohol, when neutralised with Normal Volumetric Sulphuric Acid Solution, using Hæmatoxylin Solution as an indicator, shall leave when evaporated to dryness a residue which shall respond to the *U.S.P.* tests for absence of other Cinchona alkaloids given under Quininæ Sulphas. If the aqueous alkaline liquid remaining after the extraction of the Quinine be acidified with diluted Sulphuric Acid and the liberated Salicylic Acid separated, carefully measured and dried it should possess the m.p., and answer the characteristic tests given under Acidum Salicylicum. When ignited with free access of air the salt should leave no weighable residue.

QUININÆ SALICYLAS EFFERVESCENS.—Can be obtained containing 1 and 5 grains in each drm. of Quinine Salicylate.

Saloquinine (Quinine Ester of Salicylic Acid).—Colourless crystals, or a white amorphous powder; insoluble in Water, soluble in Alcohol (90 p.c.). Antipyretic, antiseptic, and analgesic. Has been recommended in typhoid fever and in neuralgia. Is also stated to possess antirheumatic properties.—*B.M.J.* '02, i. 782; *Y.B.P.* '02, 204.

This tasteless substitute for Quinine has been further recommended *Pr.* lxxiii. 682) in 15 to 20 grain doses in malaria.

Dose.—15 to 30 grains = 1 to 2 grammes.

Rheumatine (Salicylquinine Salicylate).—Colourless crystalline needles, or as a white amorphous powder; soluble about 1 in 2000 of Water; 1 in 15 of Alcohol (90 p.c.). Antirheumatic. Useful in acute articular rheumatism. *B.M.J.* '02, i. 782; *Y.B.P.* '02, 204; *P.J.* '01, ii. 645; *C.D.* '02, i. 820.

Dose.—15 to 30 grains = 1 to 2 grammes.

QUININÆ SULPHAS ACIDUS ($C_{20}H_{24}N_2O_2.H_2SO_4.7H_2O$, eq. 544·34).—Translucent, colourless, or white, rhombic crystals. It was originally called the **Neutral Quinine Sulphate.**

It should be kept in well-stoppered glass bottles of a dark amber tint, as it has a tendency to effloresce on exposure to air.

Solubility.—1 in 10 of Water; 1 in 45 of Alcohol (90 p.c.).

Dose.—2 to 12 grains = 0·13 to 0·78 gramme.

A **solution** of 1 or 2 grains to the fl. oz. of Distilled Water applied to the eyes and nostrils for hay fever.

2 grains twice daily as a prophylactic of influenza.—*B.M.J.* '02, i. 940.

5 grains injected into the subcutaneous tissue at the angle of the scapula repeated every 3 days in malaria. Strong acids, especially Sulphuric, used to dissolve the Quinine salt may produce a local necrosis without agency of micro-organisms.—*B.M.J.* '02, i. 1113.

50 minims of a 1 in 5 solution successfully injected into each broad ligament in a case of prolapsus uteri.—*B.M.J.* '03, i. 366.

Foreign Pharmacopœias.—Official in Austr. and Hung. (Chininum bisulfuricum); Dutch (Chininum bisulphas); Fr. (Sulfate neutre de Quinine); Ital. (Bisolfato di Chinina); Jap. and U.S. (Quininæ bisulphas); Mex. (Sulfata de Quinina neutro); Span. (Sulfato Quinico neutro).

Tests.—Quinine Bisulphate when heated to a temperature of 100° C. (212° F.) loses its Water of crystallisation, the loss corresponding to 23·2 p.c. It dissolves readily in Water, forming a solution which is acid in reaction towards Litmus paper, but which is neutral in reaction towards Methyl Orange Solution. The solution exhibits a strong blue fluorescence, and when treated with a small quantity of Bromine Water it yields on the addition of Ammonia Solution in slight excess an emerald-green coloration. It also yields on the addition of Barium Chloride a white precipitate insoluble in Hydrochloric Acid. It should not lose more than 23·2 p.c. when dried at 100° C. (212° F.). The solution in Sulphuric Acid should not be of a deeper tint than a faint yellow, indicating the absence of readily charred organic impurities. The absence of Cinchona alkaloids other than Quinine may be assured by dissolving 2 grammes of the salt which has been dried at 50° C. (122° F.) in 20 c.c. of Distilled Water, and after carefully neutralising the solution with diluted Sodium Hydroxide T.S., evaporating to dryness on a water-bath, and examining the residue as directed under Quininæ Sulphas. When ignited with free access of air it should leave no weighable residue.

QUININÆ TANNAS.—A yellowish-white, amorphous powder; sparingly soluble in Water, 1 in 3 of Alcohol (90 p.c.).

It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from the light. It contains from 30 to 32 p.c. of anhydrous Quinine.

Recommended because of its being tasteless.

Dose.—1 to 10 grains = 0·065 to 0·65 gramme.

Official in Austr., Dan., Dutch, Ger., Hung., Jap., Mex., Norw., Port., Russ., Span. and Swiss.

Tests.—Quinine Tannate when mixed with diluted Sulphuric Acid, a little Bromine Water and a slight excess of Ammonia Solution yields an emerald-green coloration. The *P.G.* officially requires the salt to contain 30 p.c. of Quinine as gravimetrically determined by mixing 1 gramme of the Quinine Tannate with 4 c.c. of Water, adding Sodium Hydroxide Solution (15 p.c.) until strongly alkaline in reaction and extracting the mixture with 3 successive quantities each of 7 c.c. of Ether, evaporating the mixed ethereal solutions to dryness and drying the residue until constant in weight at 100° C. (212° F.). The Quinine obtained from the Tannate when exactly neutralised with diluted Sulphuric Acid should respond to the tests for other Cinchona alkaloids given under Quininæ Sulphas. When shaken with diluted Nitric Acid and filtered, the filtrate should remain unaltered by the addition of Hydrogen Sulphide, Silver Nitrate Solution or Barium Chloride, indicating the absence of Copper and Lead, Chlorides and Sulphates. 0·2 of a gramme of the salt when ignited with free access of air should leave no weighable residue.

QUININÆ TARTRAS ($(C_2\ H_{24}N_2O_2)_2.C_4H_6O_6.H_2O$, eq. 810·48).—A white, crystalline powder.

Solubility.—Very sparingly in Water (about 1 in 1000).

Quinine Sulphate, 80 grains; Tartaric Acid, 40 grains; Distilled Water, to measure 4 fl. drm., has been used in India for **hypodermic injection.**

QUININÆ VALERIANAS ($C_{20}H_{24}N_2O_2.\ C_5H_{10}O_2$, eq. 423·15).—White, lustrous, pearly crystals, having an odour of Valerianic Acid. Can be prepared by decomposing Quinine Hydrochloride with Sodium Valerianate.

It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from the light.

Solubility.—1 in 120 of cold Water; 1 in 2 of Alcohol (90 p.c.); 1 in 14 of Ether.

Dose.—1 to 3 grains = 0·06 to 0·2 gramme.

Official in Fr., Ital., Mex., Port., Span. and Swed.

Tests.—Quinine Valerianate melts when heated to about 90° C. (194° F.), at 100° C. (212° F.) it loses Valerianic Acid pretty rapidly. It dissolves slightly in cold Water, the solution being neutral or faintly acid in reaction towards Litmus paper. The aqueous solution affords with Ammonia Solution a white precipitate soluble in excess of the reagent. It affords when treated with a small quantity of Bromine Water and an excess of Ammonia Solution an emerald-green coloration. When acidified with diluted Sulphuric Acid Solution it evolves a characteristic odour of Valerianic Acid, the solution exhibiting a blue fluorescence. The alkaloid extracted from the salt by treatment with Ether in alkaline solution when carefully neutralised with Sulphuric Acid, using Hæmatoxylin Solution as an indicator of neutrality should respond to the test for freedom from other Cinchona alkaloids given under Quininæ Sulphas. The salt should not yield more than a faint yellow tint when mixed with concentrated Sulphuric Acid, indicating the absence of readily charred organic impurities. An aqueous solution of the salt should not be rendered distinctly turbid by Barium Chloride Solution. When ignited with free access of air it should burn without leaving a weighable residue.

Quinine Camphorate, a white powder insoluble in Water, soluble in Alcohol (90 p.c.), **dose,** 1 to 10 grains = 0·06 to 0·65 gramme; **Quinine Bihydrochloro-carbamide,** prismatic crystals soluble in Water, **dose,** 5 to 15 grains = 0·32 to 1 gramme, chiefly used hypodermically; **Quinine Saccharinate** (Basic), crystalline needles insoluble in Water; **Quinine Sulphocarbolate,** a yellowish-white powder soluble in Alcohol, **dose,** 1 to 5 grains = 0·06 to 0·32 gramme; **Quinine Sulphocresotate,** yellow scales soluble in Water, **dose,** 1 to 5 grains = 0·06 to 0·32 gramme; and **Quinine Vanadate** are salts of Quinine which have received some attention in medical literature.

SYRUPUS QUININÆ DIKINATIS.—Introduced by Dr. Donovan of Dublin.

1 fl. drm. contains 2 grains of Quinine Dikinate.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

WARBURG'S TINCTURE FOR MALARIAL FEVER.—The formula for this is given in the *M.T.* '75, ii. 540, with some interesting cases by Professor

Maclean, C.B.; Aloes Socotrinæ 4, Rad. Rhei 4, Sem. Angelicæ 4, Conf. Damocratis 4, Rad. Helenii 2, Croci Sativi 2, Sem. Fœniculi 2, Cretæ Præparatæ 2, Rad. Gentianæ 1, Rad. Zedoariæ 1, Pip. Cubebæ 1, Myrrh Elect. 1, Camphoræ 1, Bolet. Laricis 1. Digest with 500 of Proof Spirit on a water-bath for 12 hours, express, and add Quininæ Sulphatis 10. Continue heating on a water-bath till all the Quinine Sulphate is dissolved; filter when cold.

Warburg's Tincture is without its equal in persistent and protracted agues.—*T.G.* '94, 842.

A somewhat similar preparation was included in the *B.P.C. Formulary* 1901 under the title **Tinctura Antiperiodica** as follows:—

Tinctura Antiperiodica. *Syn.* Warburg's Tincture.—Socotrine Aloes, bruised, 240 grains; Rhubarb, bruised, 80 grains; Angelica Fruit, bruised, 80 grains; Elecampane Root, bruised, 40 grains; Saffron, 40 grains; Fennel, bruised, 40 grains; Prepared Chalk, 40 grains; Gentian, bruised, 20 grains; Zedoary Root, bruised, 20 grains; Cubebs, bruised, 20 grains; Myrrh, elect. and bruised, 20 grains; White Agaric, in powder, 20 grains; Opium, in powder, 2½ grains; Black Pepper, bruised, 4 grains; Cinnamon, bruised, 8 grains; Ginger, bruised, 8 grains; Alcohol (60 per cent.), a sufficient quantity.

Macerate for 7 days in 1 pint of the Alcohol, press and filter. Dissolve in the product:—Quinine Sulphate, 175 grains; Camphor, 20 grains. After 3 days filter, and add sufficient of the Alcohol to make 1 pint.

Dose.—1 to 4 fl. drm.

This has been incorporated in the *B.P.C.*

QUINETUM.—The mixed alkaloids from the E. I. Red Cinchona Bark. The Sulphate resembles Quinine Sulphate.

Solubility.—Sparingly in Water; 1 in 90 of Alcohol (90 p.c.).

Dose.—Of the Sulphate 1 to 10 grains = 0·06 to 0·65 gramme.

QUINIDINÆ SULPHAS $(C_{20}H_{24}N_2O_2)_2.H_2SO_4 2H_2O$, eq. 776·78.—White, silky crystals. It should be kept in well-stoppered bottles.

Solubility.—1 in 200 of Water; 1 in 24 of Alcohol (90 p.c.); about 1 in 100 of Glycerin.

Dose.—10 to 20 grains = 0·65 to 1·3 grammes.

QUINOIDIN. *Syn.* CHINOIDIN.—A mixture of Alkaloids, mostly amorphous, obtained as a by-product in the manufacture of the crystallisable alkaloids from Cinchona. A brownish-black mass with alkaline reaction. On ignition should not leave more than 0·7 p.c. of ash.

Official in Span.

QUINOLINE. Chinoline. C_9H_7N, eq. 128·13.—It is formed by the distillation of Quinine or Cinchonine with aqueous Potassium Hydroxide, or synthetically from Aniline and Nitrobenzene. It is a colourless, mobile liquid, having a faint aromatic odour and a peculiar penetrating taste, sparingly soluble in Water, miscible with Alcohol, Ether and Carbon Bisulphide. It should be preserved in well-stoppered bottles of an amber tint.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

CHINOLINE PERIODIDE.—Chinoline may be produced synthetically from Aniline and Nitrobenzene, or by the distillation of Quinine. The above Iodide is one of the series of Iodides introduced by Squire at the suggestion of Dr. Mortimer Granville, and employed in the treatment of gout. The Chinoline used in this preparation is not of synthetic production.—An Iodide made with Chinoline, prepared from Cinchonine, is known as **Cincho-quinoline Periodide** (*Squire*).

LORETIN (Meta-iod-orthoxychinolin-anasulphonic Acid).—A pale yellowish powder, odourless and non-poisonous. Introduced as a substitute for Iodoform. Used as a dusting powder, and in the form of Ointment.—*B.M.J.E.* '93, ii. 91; *M.A.* '95, 34; *L.* '94, ii. 31; '95, ii. 183; *M.P.* '94, ii. 25.

CHINOSOL (Quinosol. Potassium Oxychinoline Sulphonate). -A bright lemon-yellow powder with a faint odour, soluble in Water.

A powerful antiseptic, disinfectant and deodorant. Action more marked as a lotion than as a powder. When used as a powder should be diluted. Solutions for disinfection of instruments should not be too concentrated. Drug possesses toxic properties. If used in too concentrated a form subcutaneously it will produce local irritation and swelling. Is not rapidly absorbed by the unbroken skin. —*B.M.J.* '98, i. 91.

In doses of 1 to 5 grains internally and as a local application it has given good results in leprosy.—*P.J.* '99, ii. 135.

5 grains 3 times a day after food in the treatment of over one hundred cases of pulmonary phthisis. In almost every case improvement in the patient's general condition followed.—*L.* '99, ii. 90, 181, 238.

1 to 2 p.c. solution has power of arresting hæmorrhage.—*B.M.J.E.* '01, ii. 60.

Official in Russ.

Crurin (Quinoline Bismuth Sulphocyanide).—A yellowish-red powder, insoluble in Water and Alcohol. Recommended in ½ p.c. solution as an injection in gonorrhœa :—1 of Crurin rubbed up with Glycerin and Water, of each 5, and made up with Water to 200.—*B.M.J.E.* '02, i. 32 ; *C.D.* '02, i. 643 ; *P.J.* '00, i. 615 ; '00, ii. 486 ; '02, i. 442.

Vioform (Iodochloroxychinolinė; Iodochloroxyquinoline).—An almost odourless, non-toxic powder, insoluble in Water. Antiseptic and germicide. Introduced as a substitute for Iodoform. It has been found useful in operations upon tubercular joints. Most conveniently used as an emulsion :—Vioform 50, Glycerin 200, Sterilised Water 200, Alcohol 100.—*B.M.J.E.* '03, i. 31 ; *P.J.* '00, ii. 470, 700 ; '02, i. 513 ; *B.M.J.E.* '07, i. 100.

Diaphthol (Quinaseptol) and **Diaphtherin** (Oxychinaseptol) have also been used as antiseptics.

QUININÆ HYDROCHLORIDUM.

QUININE HYDROCHLORIDE.

HYDROCHLORATE OF QUININE.—*B.P.* '85.

$C_{20}H_{24}N_2O_2HCl, 2H_2O$, eq. 393·79.

FR., CHLORHYDRATE BASIQUE DE QUININE ; GER., CHININHYDROCHLORID ;
ITAL., CLORIDRATO DI CHININA ; SPAN., CLORURO QUINICO.

White, odourless, silky, needle-shaped crystals, possessing a very bitter taste, and which have a tendency to lose Water in warm air. It is officially described as the Hydrochloride of an alkaloid obtained from the Bark of various species of *Cinchona* and *Remijia.* The *U.S.P.* describes it as the Hydrochloride of the alkaloid Quinine.

It should be kept in well-stoppered glass bottles of a dark amber tint.

The salt contains theoretically 81·7 p.c. of anhydrous Quinine, 9·2 p.c. of Hydrochloric Acid and 9·1 p.c. of Water of crystallisation.

Solubility.—1 in 37 of Water ; 1 in 1 of boiling Water ; 1 in 1 of Alcohol (90 p.c.). The anhydrous salt is very soluble in Chloroform.

Medicinal Properties.—Same as Quinine Sulphate.

This salt is preferred for the prevention of ague for the following reasons: (1) it is more readily soluble and very easily absorbed ; (2) it is less irritating to the gastric mucous membrane ; (3) it contains relatively a greater proportion of Quinine ; (4) it is the chief soluble salt of Quinine, and is almost universally used in the malarial districts of Italy.—*B.M.J.E.* '03, ii. 12.

Has been shown (*B.M.J.* '04, ii. 1543) to maintain the heart's action during an operation when administered in doses of a few grains, 24 hours before the operation.

Two cases of idiosyncrasy to Quinine are noted (*Pr.* lxxiii. 682) in which the Sulphate produced alarming symptoms, whilst the Hydrochloride was well borne.

Topical use in leucorrhœa, 2 to 3 grains as a **pessary.**—*L.* '99, i. 26, 192.

As a styptic and antiseptic agent. Recommended for parenchymatous hæmorrhages.—*L.* '01, ii. 1541.

Inoperable cancer of the uterus successfully treated by endovenous injection of 4 to 8 grains.—*B.M.J.E.* '03, i. 26.

Dose.—1 to 10 grains = 0·06 to 0·65 gramme.

Official Preparations.—Tinctura Quininæ and Vinum Quininæ.

Not Official.—Pessus Quininæ, Soluté de Quinine pour Injection Hypodermique.

Foreign Pharmacopœias.—Official in Austr., Ger., Hung., Jap., Russ. and Swiss (Chininum Hydrochloricum); Belg. (Chlorhydras Quininæ); Dan., Norw., Swed. (Chloretum Chinicum); Dutch (Hydrochloras Chinini); Fr. (Chlorhydrate Basique de Quinine); Ital. (Cloridrato di Chinina); Mex. (Clorhidrato de Quinina basico); Port. (Chlorhydrato de Quinina); Span. (Cloruro Quinico); U.S. (Quininæ Hydrochloridum).

Tests.—Quinine Hydrochloride when heated to a temperature of 100° C. (212° F.) loses 9 p.c. of Water equivalent to 2 molecules of Water of crystallisation. The *U.S.P.* states it loses its Water of crystallisation at a temperature of 120° C. (248° F.), and that at about 156° C. (312·8° F.) it commences to melt, but that it is not fully melted until a temperature of 190° C. (374° F.) is reached. It dissolves fairly readily in Water, forming a solution which is neutral to Litmus paper or at the most but faintly alkaline in reaction towards red Litmus paper. On the addition of Sulphuric Acid the aqueous solution assumes a strong bluish-green fluorescence, but the solution of the Hydrochloride itself is not fluorescent. The alkaloid extracted from a solution of the Hydrochloride should answer the tests distinctive of Quinine given under that substance. The aqueous solution when acidified with Nitric Acid yields with Silver Nitrate Solution a white curdy precipitate, which, when washed, dissolves readily and completely in Ammonia Solution. The percentage of Quinine may be determined by the direct titration of a solution of the Hydrochloride with Tenth-normal Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality, 1 c.c. of the Tenth-normal Volumetric Solution being equivalent to 0·039379 gramme of the crystallised Hydrochloride. The alkaloidal content may be gravimetrically determined by dissolving the salt in Water, adding sufficient Potassium or Sodium Hydroxide Solution to render the liquid distinctly alkaline, and shaking out with Ether-Chloroform Solution.

The more generally occurring impurities are excess of moisture, Sulphates, readily charred organic impurities, Cinchona alkaloids other than Quinine, and mineral impurities. The *B.P.*, the *U.S.P.* and the *P.G.* require that the salt shall not lose more than 9 p.c. of weight when dried at a temperature of 100° C. (212° F.). An aqueous solution of the salt should not be rendered more than slightly turbid on the addition of Barium Chloride Solution, indicating the limit of

Sulphate. It should produce no coloration on the addition of Sulphuric Acid, indicating the absence of readily charred organic impurities. The *B.P.* requires that the salt should yield only the slightest characteristic reactions with the tests for Sulphates, and that when the Hydrochloride is converted into the Sulphate by mixing it with an equal weight of Sodium Sulphate and dissolving the mixture in 10 times its weight of hot Water, allowing the mixture to stand at 15·5° C. (60° F.), it should answer the tests described under Quininæ Sulphas. The *U.S.P.* requires that a weighed quantity of 3 grammes of the salt, which has been previously dried for 2 hours at a temperature of 50° C. (122° F.), when dissolved in 30 c.c. of hot Distilled Water, mixed with 1·5 grammes of crystallised Sodium Sulphate, gradually and with constant stirring, and the liquid evaporated to dryness on a water-bath, the residue when dissolved in 30 c.c. of Water should respond to the *U.S.P.* test for absence of an excessive amount of Cinchona alkaloids other than Quinine. The *P.G.* dissolves a weighed quantity of 2 grammes of the Hydrochloride in a warmed mortar in 20 c.c. of Water at a temperature of 60° C. (140° F.). To the solution is added 1 gramme of powdered uneffloresced Sodium Sulphate, and the mixture thoroughly incorporated. It is allowed to stand when cold for half an hour at a temperature of 15° C., it is then pressed through a dry piece of calico of about 100 cm. square, and the expressed fluid filtered through a piece of the best filter paper. A measured quantity of 5 c.c. of this filtrate is brought to a temperature of 15° C. (59° F.), and mixed with Ammonia Solution at a temperature of 15° C. (59° F.) until the precipitate, which at first separates out, again dissolves to a clear solution, not more than 4 c.c. of Ammonia Solution shall be required. 1 gramme of the salt when ignited with free access of air should leave no weighable residue, indicating the absence of mineral impurities. Quinine may be distinguished from Morphine by the Nitric Acid colour test, the salt should dissolve in Nitric Acid without the production of a red colour. The *P.G.* states that 0·5 of a gramme of the salt mixed with 10 drops of Sulphuric Acid and 1 drop of Nitric Acid shall not yield a reddish-yellow coloration. The *U.S.P.* includes an additional test for differentiation from Morphine, it directs that 0·1 of a gramme of the salt added to 5 c.c. of a saturated Potassium Ferricyanide Solution, 25 c.c. of Water, 15 drops of Ferric Chloride T.S. and 5 drops of diluted Hydrochloric Acid Solution should not produce a blue coloration after being well shaken and allowed to stand for 5 minutes.

Residue.—When dried at 212° F. (100° C.), 1 gramme of the salt should not lose more than 0·09 gramme in weight, *B.P.*, *P.G.* and *U.S.P.* After ignition it should leave no residue, *P.G.* and *U.S.P.*

Litmus.—Its aqueous solution is neutral, *P.G.*, or faintly alkaline, *U.S.P.*

Barium Nitrate or Chloride.—An aqueous solution of the salt should not be rendered more than faintly turbid by T.S. of Barium Chloride, *U.S.P.*, by T.S. of Barium Nitrate, *P.G.*

Sulphuric Acid.—No turbidity at all should be produced in an aqueous solution (1–50) of the salt by diluted Sulphuric Acid, *P.G.* The salt should not yield any colour with Sulphuric Acid, *U.S.P.* 0·05 gramme of the salt mixed with 10 drops of Sulphuric Acid and 1 drop of Nitrate Acid, should not assume a reddish-yellow colour, *P.G.*

Preparations.

TINCTURA QUININÆ. TINCTURE OF QUININE.

Quinine Hydrochloride, 175 grains; Tincture of Orange, 20 fl. oz.
(about 1 grain in 55 minims)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Tests.—Tincture of Quinine has a sp. gr. of 0·880 to 0·890; it contains about 3·5 p.c. w/v of total solids and about 74 p.c. w/v of Absolute Alcohol.

VINUM QUININÆ. QUININE WINE.

Quinine Hydrochloride, 20 grains; Orange Wine, 20 fl. oz.

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.

Now made with Quinine Hydrochloride instead of Sulphate.

Tests.—Quinine Wine has a sp. gr. of 1·044 to 1·095; it contains about 16 p.c. w/v of total solids and from 10 to 12 p.c. w/v of Absolute Alcohol. It should yield 0·187 p.c. w/v of anhydrous Quinine. 1 fl. oz. of the wine when made alkaline with Sodium Hydroxide Solution and shaken with Ether, the aqueous alkaline layer separated, and after acidification shaken with a further quantity of Ether; the ethereal solution when mixed with a little Water, a drop or two of Ferric Chloride Solution added and the mixture well shaken should yield no violet coloration, indicating the absence of Salicylic Acid.

Not Official.

PESSUS QUININÆ.—3 to 5 grains of Quinine Hydrochloride. A valuable remedy for leucorrhœa.—*Martindale.*

This has been incorporated in the *B.P.C.*

SOLUTÉ DE QUININE (CHLORHYDRATE BASIQUE) POUR INJECTION HYPODERMIQUE.—Basic Hydrochloride of Quinine, 3 grammes; Antipyrine, 2 grammes; Distilled Water, boiled and cooled, *q.s.* to obtain 10 c.c. of solution.—*Fr.*

QUININÆ HYDROCHLORIDUM ACIDUM.

ACID QUININE HYDROCHLORIDE.

$C_{20}H_{24}N_2O_2$, 2HCl, $3H_2O$, eq. 447·86.

FR., CHLORHYDRATE NEUTRE DE QUININE; GER., SAURES CHININHYDROCHLORID; ITAL., BICHLORIDRATO DI CHININA.

Small, colourless, glistening crystals, or as a white, odourless, crystalline powder, possessing a very bitter taste. It is officially described as the Acid Hydrochloride of an alkaloid obtained from the Bark of various species of *Cinchona* and *Remijia*, but would have been better described as the Acid Hydrochloride of the alkaloid Quinine.

It should be kept in well-stoppered glass bottles of a dark amber tint and exposed as little as possible to the air. The official formula for the salt shows 3 molecules of Water of crystallisation, but the majority of commercial specimens contain practically no Water of crystallisation. Howard states that the salt is anhydrous if dried at 100° C. (212° F.), but that the Pharmacopœia formula is correct for the crystalline salt formed at a lower temperature. The *Fr. Codex* (1908) gives the formula with 2½ molecules of Water of crystallisation, and states that from Absolute Ethylic Alcohol it forms acicular crystals containing 1 molecule of Alcohol of crystallisation which it loses readily. The dried salt when exposed to the air reabsorbs moisture, equivalent to 2½ molecules of Water of crystallisation.

Solubility.—2 in 1½ of Water and measures 3; 1 in 5 of Alcohol (90 p.c.); 1 in 7 of Chloroform. Insoluble in Ether.

Medicinal Properties.—Same as Quinine Sulphate and Hydrochloride. It is frequently employed by hypodermic injection. *See* notes on the Acid Hydrobromide.

Intramuscular injections in malaria.—*L.* '02, i. 1379.

5 to 10 grains twice a day for six weeks injected into the gluteal muscles in the treatment of ague.—*B.M.J.* '02, ii. 1767.

15 grains twice daily given on an empty stomach in the treatment of typhoid fever in the tropics.—*B.M.J.E.* '02, i. 80.

In doses of 2 to 3 grains hypodermically in the treatment of blackwater fever.—*B.M.J.* '02, i. 1334; *P.J.* '02, ii. 249.

1 to 2 grains injected into the subcutaneous tissue over the splenic area on 3 or 4 successive mornings in the treatment of malaria.—*B.M.J.* '03, i. 848.

Quinine Bihydrochloride is now exclusively recommended (*B.M.J.* '06, i. 1398) in amœbic abscess of the liver. Two solutions are prepared and sterilised before the operation, each containing 30 grains of this salt, but in one this amount is dissolved in 2 oz. of Water and in the other in 4 oz., the former being used if the abscess contains less than 10 oz. of pus and the latter if it is larger. In this way the dose of the salt is limited to 30 grains.

Dose.—1 to 10 grains = 0·06 to 0·65 gramme.

Foreign Pharmacopœias.—Official in Fr. (Chlorhydrate neutre de Quinine), Ital. and Mex.

Tests.—Quinine Bihydrochloride is officially required to lose not more than 12 p.c., equivalent to practically 3 molecules of Water of crystallisation at a temperature of 100° C. (212° F.). It dissolves readily in Water, forming a clear solution which possesses a strong acid reaction towards Litmus, and which yields, on the addition of Potassium or Sodium Hydroxide Solution, a white precipitate; if this precipitate be separated and carefully washed it answers the tests distinctive of Quinine given under that heading. An aqueous solution of the salt, when acidified with diluted Nitric Acid, yields, on the addition of Silver Nitrate solution, a white curdy precipitate, insoluble in Nitric Acid, and which, when separated and washed, dissolves readily and completely in Ammonia Solution. The total percentage of Hydrochloric Acid present may readily be determined by titration with Tenth-normal Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. In conducting the titration, sufficient neutral Ether may be added to hold the liberated alkaloid in solution, the end reaction not being then masked by the precipitate. 1 c.c. of Tenth-normal Volumetric Alkali Solution is equivalent to 0·003619 gramme of Hydrochloric Acid and to 0·044786 gramme of crystallised Acid Quinine Hydrochloride of the official formula, or to 0·039422 gramme of the anhydrous Hydrochloride. 1 gramme of the salt, when dissolved in 20 c.c. of Water, is officially stated to require not more than 2·5 c.c. of Volumetric Sodium Hydroxide Solution for its complete neutralisation. Unfortunately the *B.P.* has omitted to mention to what indicator of neutrality; if Phenolphthalein Solution be used as an indicator, considerably more than 2·5 c.c. of Volumetric Solution will be required, as indicated above the whole of the acid radicle is determined by this indicator. With Litmus and Methyl Orange Solution the results are equally unsatisfactory. A suitable indicator for the purpose would appear to be Hæmatoxylin Solution. The presence of neutral Hydrochloride of Quinine is intended to be determined by this test, and this salt is neutral in reaction towards Hæmatoxylin Solution. If the salt be mixed with an equal weight of Sodium Sulphate, the mixture dissolved in 10 times its weight of hot Water, the liquid neutralised with Ammonia Solution, cooled and set aside at 15·5° C. (60° F.), the Quinine Sulphate formed is officially required to answer the tests for freedom from other Cinchona alkaloids, given under Quininæ Sulphas. The salt should dissolve without change of colour in concentrated Sulphuric Acid, Hydrochloric Acid gas being simultaneously evolved; indicating the absence of readily charred organic impurities. It should yield no red coloration when mixed with a few drops of concentrated Nitric Acid, which distinguishes the alkaloid from Morphine. When ignited with free access of air it should leave no weighable residue.

QUININÆ SULPHAS.

QUININE SULPHATE.

$((C_{20}H_{24}N_2O_2)_2, H_2SO_4)_2, 15H_2O$, eq. 1750·24.

FR., SULFATE BASIQUE DE QUININE; GER., CHININSULFAT; ITAL., SOLFATO DI CHININA; SPAN., SULFATO QUINICO BASICO.

Light, white, odourless, silky, needle-shaped crystals, possessing a very persistent bitter taste. It is officially described as the Sulphate of an alkaloid obtained from the Bark of various species of *Cinchona* and *Remijia*; but would have been preferably described, as in the *U.S.P.*, as the Sulphate of the alkaloid Quinine.

The crystals effloresce on exposure to dry air, and yield a salt containing about 2 molecules of Water of crystallisation, these are in turn lost at a temperature of 100° C. (212° F.), but again reabsorbed on exposure of the dry salt to the air. Such a salt should be made official.

The *B.P.* formula shows 15 molecules of Water of crystallisation; the formula given in the *U.S.P.* shows 7 molecules of Water of crystallisation. According to Cownley there is no doubt that very little of the Quinine Sulphate used for dispensing purposes contains the amount of Water represented by the 15 molecules formula.

The formula of the salt official in the *Fr. Codex* (1908) shows $8H_2O$, the basic Quinine Sulphate being stated to crystallise with 8 molecules of Water of crystallisation during the cooling of its hot concentrated aqueous solutions; it contains 72·81 p.c. of Quinine, 11·01 p.c. of Sulphuric Acid and 16·18 p.c. of Water.

The *Fr. Codex* also states that from Absolute Ethylic Alcohol it forms acicular crystals containing 1 molecule of Alcohol of crystallisation which it loses readily.

It should be kept in well-closed vessels, preferably in well-stoppered glass bottles of a dark amber tint and protected as far as possible from exposure to the light, as in addition to its efflorescent nature in dry air the salt is liable to acquire a yellow or brownish colour when exposed directly to the light.

Solubility.—About 1 in 800 of Water; 1 in 25 of boiling Water; 1 in 65 of Alcohol (90 p.c.); 1 in 40 of Glycerin.

60 grains require 60 minims of diluted Sulphuric Acid, or 100 minims of diluted Phosphoric Acid for solution in 2 fl. oz. of Distilled Water.

66 grains requires 60 minims of Diluted Nitric Acid for solution in 2 fl. oz. of Water.

Medicinal Properties.—In small doses it acts as a most valuable tonic and bitter stomachic. In large doses it has a specific action in malaria, both as a curative and as a prophylactic; in moderate doses it is an antipyretic in influenza and fevers, especially enteric (in which it also acts as an antiseptic), and it is analgesic in supra-orbital and other forms of neuralgia. Used as a spray (2 grains to 1 fl. oz.) in hay fever; contra-indicated during advanced pregnancy and in acute or subacute middle-ear disease; in large doses, or if taken frequently, produces temporary deafness. Rectal injections of a strong solution most satisfactory in amœbic dysentery.

The best remedy in influenza; also, as a trustworthy prophylactic, 2 grains every morning, the late Sir W. Broadbent, *Pr.* '07, i. 13; other references to its use as a prophylactic, *B.M.J.E.* '95, ii. 92; *L.* '95, ii. 1381.

Seems to be really an antitoxin in influenza. If quinine treatment in influenza is persevered with, there will be much less cardiac weakness and fewer serious sequelæ.—*Pr.* '07, i. 153.

It retards or arrests the alcoholic, lactic and butyric fermentations, but not the digestive action of Pepsin.

In the form of a 1 p.c. solution in just sufficient Diluted Sulphuric Acid to hold the salt in solution, has been used (*L.* '05, i. 360) as a powerful curative agent in a large variety of corneal ulcers not amenable to the ordinary routine treatment, the eyes being soaked in the solution for 5 minutes 4 or 5 times a day. As regards the use of **Quinine salts** in ophthalmic work, it is pointed out (*B.M.J.* '04, i. 452) that it has been in employment for twenty years at the Liverpool Eye and Ear Infirmary, and two formulas taken from the Pharmacopœia of this institution are: Atropine Sulphate, 4 grains; Quinine Sulphate (neutral), 4 grains; Distilled Water, 1 oz.;—and Eserine Sulphate, 1 grain; Quinine Sulphate (neutral), 4 grains; Distilled Water, 1 oz.

In whooping-cough, *M.A.* '95, 522; *T.G.* '94, 126; in cholera nostras.—*B.M.J.E.* '93, ii. 7.

As a prophylactic in African fevers.—*L.* '96, i. 219.

Combined with Ipecacuanha in dysentery.—*Pr.* liv. 478; *P.J.* (3) xxv. 1167.

10 grains with half its bulk of Tartaric Acid dissolved in 10 minims of Water in the comatose and cerebral forms of remittent fever.—*B.M.J.* '99, ii. 1474.

Quinine and the malarial parasite. As the red blood corpuscle is necessary for the life of the parasite, Quinine, by driving the parasite out of its element, places it under conditions unfavourable and destructive to its development.—*B.M.J.E.* '99, ii. 68.

½ to 1 drm. doses of Ammoniated Tincture in treatment of dengue fever in Canton.—*L.* '03, i. 184.

Quinine rash caused by taking not over ½ grain.—*T.G.* '02, 8.

Applied as a dressing 1 drm. to 8 oz. in emulsion with Cod-Liver Oil in tertiary and rheumatic ulcers of the leg.—*L.* '02, i. 443.

5 to 10 grains given, dissolved in the acid portion of an effervescing Potassium Citrate mixture, in certain forms of extensive dermatitis.—*B.M.J.* '03, i. 656; *L.* '03, i. 785.

Six cases of tetanus following the injection of strong solutions of Quinine.—*B.M.J.E.* '02, i. 63.

From the results of bacteriological tests Quinine salts seem to be more potent antiseptics than Carbolic Acid or Formaldehyde, and intermediate between these and Corrosive Sublimate.—*B.M.J.E.* '02, ii. 12.

In malaria, 2 to 5 grains every 3 or 4 hours, as soon as the diagnosis has been made, yield (*Pr.* lxxiii. 681) better results than large doses at close of or before paroxysm. $\frac{1}{8}$ to $\frac{1}{4}$ grain Morphine and $\frac{1}{150}$ grain Atropine may be given if headache is severe. Another method (*B.M.J.* '04, ii. 1450) is to give 4 doses of 7½ grains, repeated at intervals of ¼ hour, in the evening of every third day during the first fortnight of the fever. Larger doses—15 to 20 grains—combined with from 15 to 20 minims of Laudanum have been recommended.—*B.M.J.E.* '04, ii. 1451. In blackwater fever (*B.M.J.E.* '04, ii. 83) it has been recommended by Koch's method—1 gramme (= 15 grains) on each of 2 consecutive days, at intervals of 10 days.

3 to 6 grains every 3 or 4 hours, combined with Ammonium Carbonate in an effervescing mixture form a good prescription in the treatment of puerperal infection. Best to begin with Quinine and Calomel, and in the later stages to administer Ferric Perchloride and Magnesium Sulphate.—*L.* '05, i. 1406.

In the prophylaxis of malaria a full dose of 10 or 15 grains should be taken on 2 successive days with an interval of 8 or 9 days before the next 2 doses are taken.—*L.* '05, ii. 540.

1 drm. of a solution made by dissolving 12 grains of the salt in 30 minims of Distilled Water and 30 minims of dilute Sulphuric Acid, injected (*B.M.J.* '05, ii. 724) into each ligament in the treatment of prolapsus uteri.

In the pyrexia of pulmonary tuberculosis the only drug which may be tried is Quinine, though it is apt to disturb the stomach. It should be given (*Edin. Med. Jour.* '05, 467) in a single dose of 20 to 30 grains, or 4 or 5 smaller doses at short intervals.

In the leucopenia of cachexial fever and Kala-azar, large doses of Quinine (60 grains daily) combined with red bone marrow have given much better results (*B.M.J.* '05, i. 710) than any yet reported by those who deny the value of the drug.

2 or 3 grains 3 times daily, combined with the external application of Iodine, have been known to cure an obstinate case of lupus erythematosus in a month. Adrenalin may with advantage be combined with the Quinine.—*B.M.J.* '05, i. 700.

In blackwater fever 15 to 18 grains hypodermically at once and 10 to 12 grains 3 times a day for 5 days, and twice a day for 2 following days.—*L.* '05, ii. 599.

The value of Quinine in the treatment of blackwater fever has been challenged, and the question whether the fever can be induced by its administration has been much discussed. A case reported by Dr. A. D. Ketchen in the *South African Medical Record* (*L.* '06, ii. 820) appears to prove that it can.

Dose.—1 to 10 grains = 0·06 to 0·65 gramme.

Prescribing Notes.—*Given in* **pills** *or* **cachets,** *also in* **aqueous solution** *assisted by the addition of Diluted Sulphuric or Diluted Hydrochloric Acid, 1 minim to each grain; it also dissolves readily in Tincture of Ferric Chloride.*

One of the most pleasant ways of giving Quinine is in a **mixture** *with Citric Acid, to be taken during* **effervescence** *with a solution containing Potassium Bicarbonate and Ammonium Carbonate. It is also given in solution with Hydrobromic Acid to diminish the tendency to cinchonism. Milk covers the taste well. Effervescent Quinine Citrate is also a very palatable form.*

For disguising the taste of Quinine, when administered to children, Chocolate has been suggested.

When a large dose (say 10 grains) is given, it is best suspended in Water; the bitterness is not then so intense as when in solution.

It is best made into **pills** *with 'Diluted Glucose.'*

For **hypodermic injection** *see other salts of Quinine, under each of which* *the solubilities are given. Of the neutral salts, the Lactate* (1 *in* 4) *is the most soluble; of the acid salts, the Acid Hydrochloride* (1 *in* 1).

Quinine is precipitated from aqueous solutions of its salts by alkalis. In the Ammoniated Tincture of Quinine the alkaloid is dissolved by the Alcohol.

Incompatibles. All alkalis and their Carbonates, Benzoates, Iodides, and Salicylates; all infusions containing Tannin throw down a Quinine Tannate, which Sulphuric Acid, instead of dissolving, helps to precipitate.

Official Preparations.—Pilula Quininæ Sulphatis and Tinctura Quininæ Ammoniata. Used in the preparation of Ferri et Quininæ Citras and Syrupus Ferri Phosphatis cum Quinina et Strychnina.

Not Official.—Ammoniated Quinine Capsules, Elixir Quininæ Ammoniatum, Mistura Quininæ, Mistura Quininæ cum Ferro, Pilulæ Metallorum, Pilulæ Quininæ Sulphatis Compositæ, Aitken's Tonic Pill, Pilula Quininæ cum Ferro.

Foreign Pharmacopœias.—Official in Austr., Ger., Hung., Jap., Russ. and Swiss (Chininum Sulfuricum); Belg. (Sulphas Quininæ); Dan., Norw. and Swed. (Sulphas Chinicus); Dutch (Sulphas Chinini); Fr. (Sulfate Basique de Quinine); Ital. (Solfato di Chinina); Mex. and Port. (Sulfato de Quinina); Span. (Sulfato Quinico basico); U.S. (Quininæ Sulphas).

Tests.—Quinine Sulphate is officially required to lose 11 molecules, equivalent to 11·2 p.c. of Water of crystallisation when exposed to dry air, and a freshly prepared salt should lose, according to the official requirements, 15·2 p.c. of Water when dried at 100° C. (212° F.). The *U.S.P.* states that when exposed to dry air or when heated to 60° C. (140° F.) it loses 5 molecules, equivalent to 10·3 p.c. of Water of crystallisation; the remaining number of molecules equivalent to 4·1 p.c. being lost at a temperature of 115° C. (239° F.); indicating a total loss of 14·4 p.c. The *P.G.* states that the salt shall lose not more than 15 p.c. when heated at a temperature of 100° C. (212° F.). *Fr. Codex* states that when exposed to the air it rapidly effloresces, losing 6 molecules of Water of crystallisation, equivalent to 12·13 p.c., leaving a salt containing 2 molecules of Water of crystallisation, equivalent to 4·60 p.c. The salt loses the whole of its Water of crystallisation only slowly at 100° C. (212° F.), but at 115° C. (239° F.) it becomes rapidly anhydrous. Neither the *B.P.* nor the *P.G.* refers to the m.p. of the dried salt. The *U.S.P.* states that when dried over Sulphuric Acid it melts at 205° C. (401° F.). The salt dissolves sparingly in Water, forming a solution which is neutral in reaction towards Litmus paper, and which possesses but a slight fluorescence. The *B.P.* states that the aqueous solution has a bluish fluorescence; the *U.S.P.* that the aqueous solution develops a vivid blue fluorescence when acidified with diluted Sulphuric Acid. The *P.G.* states that the aqueous solution exhibits no fluorescence, but on the addition of a few drops of diluted Sulphuric Acid a blue fluorescence is developed. A solution of the salt affords with Ammonia Solution a white precipitate soluble in excess of the reagent or in Ether. The separated alkaloid answers the tests distinctive of Quinine given under Quinina. When acidified with Hydrochloric Acid the aqueous solution affords with Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid.

The more generally occurring impurities are deficiency of Water of crystallisation, readily charred organic impurities, Ammonium

Sulphate and inorganic salts, Morphine, mineral impurities, Cinchonidine, Cinchonine and amorphous Cinchona alkaloids. The *B.P.*, as above stated, requires that a freshly prepared salt, when dried at 100° C. (212° F.), should lose 15·2 p.c. of Water. The *U.S.P.* requires that the residue remaining on drying 1 gramme of the salt at a temperature of 115° C. (239° F.) until it ceases to lose weight, should weigh not less than 0·838 gramme, indicating a loss of 16·18 p.c., equivalent to 8 molecules of Water of crystallisation, although the formula given only shows $7H_2O$. The *P.G.* requires that when dried at 100° C. (212° F.) it shall lose not more than 15 p.c. by weight. The salt should not acquire a faintly yellowish tint when mixed with Sulphuric Acid, indicating the absence of readily charred organic impurities. The *P.G.* and the *U.S.P.* include a test for the absence of Ammonium Sulphate and inorganic salts described in small type below under the heading of Chloroform and Alcohol. No similar test is mentioned in the *B.P.* Quinine may be distinguished from Morphine by the Nitric Acid test also described in small type. The *P.G.* includes a test for Chlorides with Silver Nitrate. 1 gramme of the salt, when ignited with free access of air, should leave no weighable residue. The natural and most probable impurity is Cinchonidine Sulphate, which is generally present to some extent in the commercial Sulphate. The *B.P.* requires that when tested according to the official method the salt should not yield an appreciable reaction distinctive of Cinchonine, Cupreine, Quinidine or amorphous alkaloid, and that not more than a total of 3 p.c. of impure Cinchonidine crystals should be yielded when the sample is assayed according to the official test, which means about double this amount in the sample. The *B.P.* includes tests for the alkaloids Quinidine and Cupreine, but they are very unlikely impurities. The test for Cinchonidine and Cinchonine depends upon two principal features, the comparative solubilities of the Sulphates in Water and the relative insolubility of Cinchonidine and Cinchonine in Ether. Quinine Sulphate is soluble 1 in about 800 of Water, Cinchonidine Sulphate 1 in 100 of Water and Cinchonine Sulphate 1 in 70 of Water, and advantage is taken of the comparative insolubility of Quinine Sulphate in cold Water to remove a greater portion of the Quinine by crystallisation. Freshly precipitated Quinine is readily soluble in Ether, whereas both Cinchonidine and Cinchonine require comparatively large quantities of Ether to effect solution. Opinions differ as to whether it is preferable to effect solution of the Cinchonidine and Cinchonine Sulphates by digesting a weighed quantity of the sample with a limited amount of Water at 60° C. (140° F.), or to use sufficient Water at a temperature of 100° C. (212° F.) to dissolve all three Sulphates and to decompose any double Sulphate of the two alkaloids, subsequently cooling to 50° C. (122° F.). It seems to be generally conceded that simple digestion of the salt with Water at 15·5° C. (60° F.) does not effect solution of the more soluble salt, owing possibly to the existence of a double Sulphate. When, however, solution of the mixed Sulphates is made in just about sufficient boiling Water to effect solution, the less soluble salt crystallises out almost entirely, leaving the more soluble salt in solution. In the *Fr. Codex* method, which is described below, solution is effected at a boiling temperature and the *B.P.* dissolves a weighed quantity of 4 grammes of the salt in 120 c.c. of boiling Water, and after cooling the solution gradually to 50° C. (122° F.) with intervals of frequent stirring, filters off the recrystallised Sulphate and evaporates the filtrate to a volume of somewhat less than 10 c.c., which is transferred to a small stoppered flask and shaken when cold with 10 c.c. of Ether and 5 c.c. of Ammonia Solution. Any crystals which separate out after the mixture has been allowed to remain at rest in a cool place for not less than 24 hours are collected on a tared filter and dried at a temperature of 100° C. (212° F.); after previously washing with a little Ether. When cool they are weighed and the weight should not amount to more than 0·12 of a gramme, indicating not more than 3 p.c. of impure Cinchonidine. The *U.S.P.* and the *P.G.* do not employ the Ether-solubility test, but use that with Ammonia Solution described below. The *B.P.* test has been severely and very adversely criticised. It has been shown by Cownley (*P.J.* '98, i. 412) that Cinchonine and Cupreine are never present in Quinine Sulphate of any known commercial manufacture; moreover, Cupreine occurs in Cuprea Bark (Remijia pedunculata), now seldom if ever employed by Quinine manufacturers, and in any case it could only exist in Quinine Sulphate to the extent of a few hundredths p.c. A yield of 3 p.c. of crystals of Cinchonidine (by the *B.P.* test) really means an admixture of 5·99 p.c. crystallised Cinchonidine Sulphate in Quinine Sulphate answering the *B.P.* requirements, while the 1885 *B.P.* stipulated that a Quinine Sulphate should not contain much more than 5 p.c. of Sulphates of other Cinchona alkaloids. It would therefore have been better for the Pharmacopœia, failing the insertion of a satisfactory test, to describe that limit of impurity leaving its determination, when necessary, in the hands of those competent to undertake it. Paul, who has experimented extensively on the *B.P.* tests for Cinchonidine, suggests (*C.D.* '04, ii. 429) the following method of procedure:—A weighed quantity of 1 gramme of the Quinine Sulphate to be examined is dissolved in 100 c.c. of boiling Distilled Water, the solution after cooling is filtered from the crystallised salt, the filtrate concentrated to 30 c.c. Any further crystals which may have formed are separated by passing the cooled solution through a loose plug of Cotton-Wool fitted in the neck of a funnel, and the volume of the solution is made up to 30 c.c. if necessary, by washing the crystals with a few drops of Water. A measured quantity of 5 c.c. of this solution, after adding 5 drops of Ammonia Solution, is shaken with 1 c.c. of Ether in a corked tube, the tube being allowed to remain in a cool place for 1 hour. If at the end of that time no crystals are formed in the solution the quantity of Cinchonidine in the 5 c.c. of the solution must be less than 0·004 gramme, and the corresponding quantity of Sulphate in 1 gramme of the salt under examination would not be more than 0·0324 (= 0·004 × 1·35 grammes), or 3·24 p.c. In the more than probable case of crystals being formed in appreciable quantity within a shorter time than 1 hour the amount of the salt under examination will be more than 3·24 p.c. To ascertain how much more it may be, shake out a volume of less than 5 c.c. with 1 c.c. of Ether, repeat that operation until a difference amounting to 0·5 c.c. of solution, between two experiments, also corresponds to entire absence of crystals in the one instance and the very slight formation of crystals in the other after 12 hours; then take the mean of those two quantities of solution as containing 0·004 gramme of Cinchonidine and calculate the percentage of Sulphate on that basis. Thus for example, if 4 c.c. of solution gave no crystals and 4·5 c.c. only a very little after 12 hours, 4·25 c.c. is to be taken as the quantity containing 0·004 gramme of Cinchonidine in the calculation, as follows: 4·25 c.c. : 0·004 = 30 c.c. : 0·0282 × 1·35 = 0·038 gramme in 1 gramme, or 3·8 p.c. of Cinchonidine Sulphate in the sample operated upon. Paul states that the operations requisite in applying the Ether test are extremely simple, and while they admit of being carried out with ease, the results obtainable are not deficient in accuracy. The *U.S.P.* and *P.G.* tests depend upon the amount of Ammonia Solution required to redissolve the precipitate at first formed in a strictly neutral aqueous solution of the salt, from which the greater portion of the Quinine Sulphate has been removed by recrystallisation, so as to produce a clear liquid. The *U.S.P.* test is described in small type below under the heading of Ammonia Solution. The *P.G.* test which differs slightly from the *U.S.P.* is virtually as follows: A weighed quantity of 2 grammes of the Quinine Sulphate which has been previously completely dried at a temperature of 40° to 50° C. (104° to 122° F.) is digested with 20 c.c. of Water for half an hour in a water-bath at a temperature of 60° to 65° C. (140° to 149° F.) with intervals of frequent shaking, it is then placed in Water at 15° C. (59° F.), and allowed to stand for 2 hours with intervals of vigorous shaking. The crystals are separated by filtration through a piece of dry calico of a capacity of about 100 cm. square, the expressed liquid is filtered through a filter prepared from the best filter paper of about 7 cm. diameter. A measured quantity of 5 c.c. of the filtrate having a temperature of 15° C. (59° F.) is transferred to a dry test-tube, and sufficient Ammonia Solution having a temperature of 15° C. (59° F.) added to completely dissolve the precipitate at first produced, and to produce a clear solution, not more than 4 c.c. of Ammonia Solution should be necessary. The *Fr. Codex* (1908) also employs the Ammonia test for detecting the presence of other Cinchona alkaloids, and for their detection the following method is given: 1 gramme of the official basic Quinine Sulphate is dissolved at a boiling temperature in 30 grammes of Distilled Water, is allowed to cool to 15° C. (59° F.) and maintained at that temperature during half an hour, the vessel being immersed in a water-bath maintained at a temperature of 15° C. (59° F), and frequently shaken. The liquid is filtered at this temperature, and the 2 following tests are performed on the liquid. (1) A measured quantity of 5 c.c. of the limpid liquid is transferred, by means of a graduated pipette, to an assay tube, and exactly 5 c.c. of a 10 p.c. w/w Ammonia Solution added, care being taken to disturb the flask as little as possible during the mixing of the liquid. The tube is stoppered and gently inverted several times, the Quinine at first precipitated is redissolved, and a limpid mixture should be obtained, which should remain in this condition during 24 hours. A permanent turbidity or slow deposition of crystals in the previously clear liquid indicates the presence of alkaloids other than Quinine. (2) A measured quantity of 5 c.c. of the original limpid liquid is transferred to a small accurately tared porcelain evaporating basin, evaporated on a water-bath at a temperature of 100° C. (212° F.) until the evaporating basin and its contents no longer show a variation in weight, the residue left on evaporation of the 5 c.c. of liquid should not weigh more than 0·008 of a gramme. The presence of other soluble salts increases the weight of this residue.

The Ammonia test for Quinine Sulphate has been criticised (*C.D.* '05, i. 488), and the results of some experiments dealing with the solubility of Quinine in Ammonia are there recorded. With a view of removing several factors tending to invalidate the Ammonia test, the use of a solution of a fixed Hydroxide instead of Ammonia was suggested; Potassium and Sodium Hydroxide were tried, but the Calcium Hydroxide Solution (*B.P.*) was finally chosen, as it was readily made of constant strength, was less liable to impurity, and any decomposition is evident to the eye. In addition to the evidence of solution of the precipitated alkaloid confirmed by the eye, a determination of the Sulphuric Acid radicle is suggested, Phenolphthalein Solution being employed as an indicator of neutrality. It was found that 20 c.c. of a saturated aqueous solution of purified Quinine Sulphate, to which 3 drops of Phenolphthalein Solution were added, required 2 c.c. of Calcium Hydroxide Solution (*B.P.*), whilst 20 c.c. of Cinchonidine Sulphate Solution required 13·7 c.c. of a similar solution; thus a double method of testing the purity of the Sulphate, *e.g.*, the solubility of the alkaloids and the quantity of Sulphuric Acid radicle in the aqueous solution is available. The value of the methods was tried with 5 grammes of commercial Quinine Sulphate, each treated with 100 c.c. of Water at 60° C. (140° F.) for 1 hour, frequently shaking, then cooling to 15° C. (59° F.), keeping at this temperature for 2 hours, frequently stirring, and then filtering. 20 c.c. of the Quinine Sulphate Solution required 41 c.c. of Calcium Hydroxide Solution (*B.P.*) to form a clear solution, and 2·8 c.c. of a similar solution, when titrated using Phenolphthalein Solution as an indicator. A mixture containing 1 p.c. of Cinchonidine required 45 c.c. of Calcium Hydroxide Solution (*B.P.*) to form a clear solution, and 3·3 c.c. when titrated, using Phenolphthalein Solution as an indicator. A mixture containing 3 p.c. of Cinchonidine required 55 c.c. of the Calcium Hydroxide Solution to form a clear solution, and 3·8 c.c. for titration; whilst a mixture containing 5 p.c. of Cinchonidine required 71 c.c. of the Calcium Hydroxide Solution to form a clear solution, and 4·7 c.c. for titration. In view of the remarks respecting Quinidine and Cupreine which appear above, the advantage of retaining tests for the presence of these alkaloids is doubtful, but if their presence is suspected the following brief outlines of the methods adopted for their detection may be useful. The *B.P.* test for Quinidine depends upon the precipitation of Quinidine Hydriodide by the addition of Potassium Iodide Solution, precaution being taken to prevent precipitation of amorphous Iodides by the addition of a little Alcohol (90 p.c.). The major portion of the Quinine Sulphate is removed from a weighed quantity of 1 gramme of the salt by dissolving it in 30 c.c. of boiling Water, cooling and filtering. A little Alcohol (90 p.c.) is added to the cold filtrate and sufficient Potassium Iodide Solution to precipitate the Quinidine Hydriodide, which is collected on a tared filter, washed with a little Water, dried till constant in weight, and when cool, weighed; its weight represents about an equal quantity of crystallised Quinidine Sulphate. It is officially required to yield none, or only the slightest traces. Cupreine forms a Sulphate which is sparingly soluble in Water, and this Sulphate will appear with the recrystallised Quinine Sulphate obtained in the first stages of the Cinchonidine test. The *B.P.* removes it from this crystalline precipitate by adding 6 c.c. of Ammonia Solution, and shaking with 25 c.c. of Ether, and this ethereal solution is mixed with the ethereal liquid obtained in the washing of the impure Cinchonidine crystals, and from the mixed ethereal liquids the Cupreine is separated by shaking with 6 c.c. of Sodium Hydroxide Solution (10 p.c.), Cupreine forming with an excess of Sodium Hydroxide Solution a definite crystallisable compound which cannot be extracted by Ether. The alkaline layer after separation is shaken with Ether to remove all traces of other alkaloids, and after being exactly neutralised with diluted Sulphuric Acid the Cupreine Sulphate is allowed to crystallise. This involves the presence of a fair quantity of Cupreine, and it would have been preferable to add Ammonium Chloride to the alkaline solution, to extract with Ether, or to neutralise the alkaline liquid with diluted Sulphuric Acid, to add Ammonia Solution and to extract with Ether. In the event of Cupreine being present it will separate out in crystals from the ethereal solution. The *B.P.* requires the sample to be either free from this alkaloid, or at the most to contain the slightest traces. In testing for Cinchonine and amorphous alkaloids the *B.P.* dissolves 1 gramme of the Sulphate in 30 c.c. of boiling Water, precipitating the Quinine and other crystalline alkaloids by the addition of 1 gramme of Sodium Potassium Tartrate; the cold filtered aqueous liquid when evaporated to a small bulk is officially required to yield little or no precipitate with Ammonia Solution. The remarks on the British Pharmacopœia tests for these latter alkaloids appear above.

Residue.—After ignition the salt should not leave any residue, *B.P.*, *P.G.* and *U.S.P.*

Chloroform and Alcohol.—1 gramme of the salt, when gently heated to 50° C. (122° F.) with 7 c.c. of a mixture of 2 volumes of Chloroform and 1 volume of Absolute Alcohol, should completely dissolve and the solution should remain clear on cooling, *U.S.P.* and *P.G.*; the latter stating a temperature of from 40° to 50° C. (104° to 122° F.).

Sulphuric Acid.—Sulphuric Acid should impart to the salt not more than a faintly yellowish tint, *U.S.P.*; the salt should scarcely be coloured when moistened with Sulphuric Acid, *P.G.*

Nitric Acid.—Nitric Acid should not produce a red colour, *U.S.P.*; the salt should scarcely be coloured when moistened with Nitric Acid, *P.G.*

Silver Nitrate.—An aqueous solution of the salt, after acidifying with Nitric Acid, should not be affected by T.S. of Silver Nitrate, *P.G.*

Ammonia Solution.—The Quinine Sulphate is dried in a porcelain dish on a water-bath for 2 hours at 50° C. (122° F.).

Transfer a weighed quantity of 1·8 grammes of the dried residue (which should be neutral or slightly alkaline to Litmus paper) to a dry test-tube and agitate it with 20 c.c. of Distilled Water for half an hour at 65° C. (149° F.) and then allow it to cool to 15° C. (59° F.), and keep the temperature at 15° C. (59° F.) for 2 hours, shaking the test-tube occasionally. Filter the liquid, transfer 5 c.c. of the filtrate to a test-tube, and carefully add 7 c.c. of Ammonia Water (which must be of official strength and have the temperature of exactly 15° C. (59° F.) and must be all added at once). A clear liquid should result. If the temperature during the maceration has been 16° C. (60·8° F.) 7·5 c.c. of Ammonia Water may be added. If 17° C. (62·8° F.) 8 c.c. may be added (limit of allowable foreign Cinchona alkaloids), *U.S.P.*

Preparations.

PILULA QUININÆ SULPHATIS. PILL OF QUININE SULPHATE.

Triturate 30 grains of Quinine Sulphate with 1 grain of Tartaric Acid, and add them to the previously mixed Glycerin, 4 grains, and Tragacanth, 1 grain.

Dose—2 to 8 grains = 0·13 to 0·52 gramme.

TINCTURA QUININÆ AMMONIATA. AMMONIATED TINCTURE OF QUININE.

Quinine Sulphate, 175 grains; Solution of Ammonia, 2 fl. oz.; Alcohol (60 p.c.), 18 fl. oz. (about 1 grain in 55 minims)

When first made the Tincture usually deposits a little, so it is better to allow a day or two to elapse before filtering.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

When mixed with Water the Quinine is precipitated in a fine state of division, but the particles soon aggregate and adhere to the sides of the glass; therefore this preparation should not be prescribed in mixtures unless Mucilage of Acacia be used to suspend the Quinine.

When prepared with Ammonium Carbonate instead of Liquor the Tincture does not precipitate so badly, and it may be diluted with Water saturated with Carbonic Acid without any precipitation at all.

Tests.—Ammoniated Tincture of Quinine possesses a sp. gr. of 0·9225 to 0·9230; it contains about 1·8 p.c. w/v of total solids and about 54 p.c. w/v of Absolute Alcohol. 10 c.c. of the Tincture requires for neutralisation about 5·5 c.c. of Normal Volumetric Sulphuric Acid Solution, using Cochineal Solution as an indicator of neutrality.

Not Official.

AMMONIATED QUININE CAPSULES.—Quinine Sulphate, 60 grains; Ammonium Carbonate (powdered finely), 100 grains; Soft Paraffin and Liquid Paraffin, *q.s.* to make a thin paste and fill 100 capsules. Each capsule represents about 30 minims of Ammoniated Tincture of Quinine.

ELIXIR QUININÆ AMMONIATUM.—Quinine Sulphate, 1; Ammonium Carbonate, 3; Alcohol, 25; Solution of Carmine, 0·25; Elixir of Orange, 50; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

MISTURA QUININÆ.—Quinine Sulphate, 1 grain; Diluted Sulphuric Acid, *q.s.*; Distilled Water, to 1 fl. oz.—*London Ophthalmic.*

Quinine Sulphate, 1 grain; diluted Sulphuric Acid, 1 minim; Tincture of Orange, 10 minims; Water, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

MISTURA QUININÆ CUM FERRO.—Quinine Sulphate, 1 grain; Solution of Ferric Chloride, 10 minims; Water, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

PILULÆ METALLORUM.—Quinine Sulphate, 1 grain; Reduced Iron, 1 grain; Strychnine (alkaloid), $\frac{1}{20}$ grain; Arsenic Trioxide, $\frac{1}{20}$ grain; in one pill.—*U.S.N.F.*

Note.—A similar combination is known under the name of Aitken's Tonic Pills:—

Quinine Sulphate, 1 grain; Reduced Iron, $\frac{2}{3}$ grain; Strychnine (alkaloid), $\frac{1}{50}$ grain; Arsenic Trioxide, $\frac{1}{50}$ grain; in one pill.—*U.S.N.F.*

This has been incorporated in the *B.P.C.* as follows:—

Pilulæ Quininæ Sulphatis Compositæ. *Syn.* Aitkin's Tonic Pills.—Quinine Sulphate, $\frac{1}{2}$ grain; Reduced Iron, $\frac{1}{3}$ grain; Arsenious Anhydride, $\frac{1}{100}$ grain; Strychnine, $\frac{1}{100}$ grain; Extract of Gentian, *q.s.*, in 1 pill.—*B.P.C.*

Aitken's Tonic Pill.—Quinine Sulphate, 1 grain; Reduced Iron, $\frac{2}{3}$ grain; Arsenious Anhydride, $\frac{1}{50}$ grain; Strychnine, $\frac{1}{50}$ grain; Extract of Gentian, *q.s.*—*Pharm. Form.*

PILULA QUININÆ CUM FERRO.—Quinine Sulphate, 1 grain; Ferrous Sulphate, 1 grain; Extract of Gentian, 3 grains; in each pill.—*Brompton.*

Quinine Sulphate, 1 grain; Exsiccated Ferrous Sulphate, 1 grain; in each pill.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

RESINA.

RESIN.

Fr., Colophane; Ger., Kolophonium; Ital., Colofonia; Span., Colofonia.

A translucent, pale amber-coloured, brittle solid, having a terebinthinate odour. Readily reduced to powder. It is officially described as the residue from the crude Oleo-Resin of various species of *Pinus*, after the Oil of Turpentine has been removed by distillation.

Solubility.—In almost all proportions of Alcohol (90 p.c.) Ether, and Oil of Turpentine; also in hot Olive Oil.

Medicinal Properties.—Antiseptic, and slightly stimulant. It is an **ingredient** of plasters used for strapping wounds. The **ointment** forms a stimulating dressing for indolent ulcers and sores. Never used internally.

Official Preparations.—Emplastrum Resinæ and Unguentum Resinæ. Used in the preparation of Emplastrum Calefaciens, Emplastrum Cantharidis, Emplastrum Menthol, Emplastrum Picis, Emplastrum Plumbi Iodidi, Emplastrum Saponis.

Not Official.—Resina Carbolica, Resina Carbolisata.

Resin Plaster is contained in Emplastrum Belladonnæ, Emplastrum Opii, also in Emplastrum Calefaciens.

Foreign Pharmacopœias.—Official in all as Colophonium; Span. (Colofonia and Resina commune) and U.S. (Resina).

Descriptive Notes.—The Resin of commerce is met with in various grades, from the nearly black Colophony to the water-white or almost colourless, transparent kind. The official variety apparently agrees with the characters of the grade known in trade as Amber Resin. It is transparent, amorphous and very brittle; the freshly fractured surface is shiny and slightly concave, with a faintly terebinthinate odour. The Resin of commerce varies in the amount of Turpentine Oil that it retains. The 'water-white' and 'window-glass' Resins are useful for colourless varnishes. The yellow opaque Resin is made by stirring Water into the Resin after distillation of the Oil of Turpentine, but it loses Water and becomes translucent when heated. Powdered Resin should not cohere into masses.

Tests.—Resin has a sp. gr. of 1·07 to 1·085, the *U.S.P.* states 1·070 to 1·080; the *P.G.* does not refer to a sp. gr. When heated it melts, when strongly heated it evolves heavy white vapours possessing an aromatic odour, and when ignited burns readily with a yellow flame, emitting a dense sooty smoke. It dissolves readily and completely in Alcohol (90 p.c.), Benzol, Carbon Bisulphide and Ether. The *U.S.P.* states that it is soluble in Acetic Acid (36 p.c. w/w), Alcohol (94·9 p.c.), Benzene, Carbon Bisulphide, Ether, fixed or volatile Oils, and in Potassium or Sodium Hydroxide Solutions. The *P.G.* states that it dissolves slowly in 1 part of Alcohol (90 p.c.), and in 1 part of Acetic Acid (96 p.c. w/w), also in Sodium Hydroxide Solution (15 p.c. w/w). The Acid value varies from 150 to 185, the Ester value from 0 to 12; the Saponification value from 179 to 193. The *U.S.P.* states the Acid value should not be less than 150, the *P.G.* 151·6 to 179·7. Neither the *U.S.P.* nor the *P.G.* includes an Ester or Saponification value. Neither an Acid, Ester nor Saponification value is included in the *B.P.* The presence of Turpentine Oil may be detected by the solubility of the Resin in Alcohol (90 p.c.). When ignited with free access of air it should burn leaving no weighable residue, indicating the absence of mineral impurities.

Acid Value.—A weighed quantity of 1 gramme of the Resin is dissolved in a sufficiency of Alcohol (94·9 p.c.), a few drops of Phenolphthalein Solution added, and the mixture titrated with Normal Volumetric Potassium Hydroxide Solution. The number of c.c. of Normal Volumetric Potassium Hydroxide Solution consumed multiplied by 0·05574 indicates the number of grammes of Potassium Hydroxide, and this figure expressed in mg. indicates the Saponification value of the Resin, which in this case should be not less than 150, *U.S.P.*

A weighed quantity of 1 gramme of the Resin is dissolved in 25 c.c. of Semi-normal Volumetric Alcoholic Potassium Hydroxide Solution, and after the addition of 10 drops of Phenolphthalein Solution the excess is titrated with Semi-normal Volumetric Hydrochloric Acid Solution; from 18·6 to 19·6 c.c. should be necessary to neutralise this excess, *P.G.*

Preparation.

EMPLASTRUM RESINÆ. Resin Plaster. *B.P.Syn.*—Adhesive Plaster.

Resin, 4; Lead Plaster, 32; Hard Soap, 2. (1 in 9½)

Now made with Hard Soap instead of Curd Soap.

Foreign Pharmacopœias.—Official in Austr., Lead Plaster 10, Wool Fat 1, Yellow Wax 1, Turpentine 1, Colophonium 1, Dammar 1; Belg. and Swiss, Lead Plaster 80, Elemi 5, Yellow Wax 5, Colophonium 5, Turpentine 5; Dan. and Swed., Lead Plaster 8, Colophonium 2; Dutch, Lead Plaster 70, Gum Elastic 10, Wool Fat 20; Ger., Lead Plaster 40, Solid Paraffin 2·5, Liquid Paraffin 2·5, Colophonium 35, Dammar 10, Caoutchouc 10, Petroleum Benzine 75; Hung., Lead Plaster 400, Purified Colophonium 100, Turpentine 25; Ital., Lead Plaster 40, Burgundy Pitch 7, Yellow Wax 3; Mex., Lead Plaster 100, Yellow Wax 10, Dammar 10, Colophonium 10, Turpentine 10; Norw., Lead Plaster 8, Yellow Wax 1, Mastic 1; Russ., Litharge 11, Olive Oil commune 10, Lard 10, Colophonium 8·5; and U.S., Lead Plaster 96, Rubber 2, Petrolatum 2; all (Emplastrum Adhæsivum). Jap. (Emplastrum Resina), Lead Plaster 80, Yellow Wax 6, Resin 14; Span., Emplasto de Resinas Aglutinante, Lead Plaster 60, Olive Oil 75, Turpentine 75, Yellow Wax 90, Elemi 180, Pine Resin 570.

UNGUENTUM RESINÆ. RESIN OINTMENT. *N.O.Syn.*—BASILICON OINTMENT.

Resin, in powder, 8; Yellow Beeswax, 8; Olive Oil (by weight), 8; Lard, 6. (1 in $3\frac{3}{4}$)

Olive Oil and Lard used in place of Almond Oil and Simple Ointment, and the quantity of Beeswax increased.

Foreign Pharmacopœias.—Official in Austr. (Unguentum Basilicum), Yellow Wax 16, Olive Oil 36, Colophonium 12, Suet 12, Turpentine 12, Pitch 12; Dutch (Unguentum Resinosum Flavum), Yellow Wax 18, Colophonium 8, Sesame Oil 70, Turpentine 4; Fr. (Pommade de Styrax), Purified Liquid Storax 16, Colophonium 29, Purified Elemi 16, Yellow Wax 16, Olive Oil 23; Ger. (Unguentum Basilicum), Olive Oil 9, Yellow Wax 3, Colophonium 3, Suet 3, Turpentine 2; Mex. (Unguento Amarilla), Yellow Wax 6, Colophonium 5, Suet 4, Aceite 12; Norw. (Unguentum Basilicum Nigrum), Colophonium 12, Yellow Wax 12, Pitch 12, Suet 12, Turpentine 12, Olive Oil 40; Port. (Unguento de Resina), Yellow Wax 25, Resin 25, Oleo de Amendoin 50; Span. (Unguento de Altea), Turpentine 50, Althæa Root 100, Water 100, Yellow Wax 160, Pine Resin 160, Olive Oil 750; Swed. (Unguentum Terebinthinæ Resinosum), Colophonium 15, Suet 15, Turpentine 10, Yellow Wax 15, Olive Oil 45; Swiss (Unguentum Resinosum), Colophonium 9, Turpentine 9, Yellow Wax 17, Olive Oil 65; U.S. (Ceratum Resinæ), Rosin 35, Yellow Wax 15, Lard 50; also (Ceratum Resinæ Compositum), Rosin 225, Yellow Wax 225, Prepared Suet 300, Turpentine 115, Linseed Oil 135.

Not Official.

RESINA CARBOLICA (R.D.H.).—Resin, 4 parts; Carbolic Acid, 4 parts; Chloroform, 3 parts. Dissolve and filter.

Resina Carbolisata.—Carbolic Acid, 3·5; Resin, in powder, 4·5; Chloroform, 2·0.—*B.P.C.*

Not Official.

RESORCINUM.

RESORCIN.

METADIOXYBENZOLUM. RESORCINOL.

$C_6H_4(HO)_2$, eq. 109·22.

FR., RÉSORCINE; GER., RESORCIN; ITAL., RESORCINA; SPAN., RESORCINA.

White, or nearly white, glistening, needle-shaped, or prismatic crystals, having a peculiar characteristic odour, and sweetish, pungent taste. It may be obtained by the destructive distillation of Brazilin, or by fusing Sodium Benzoldisulphonate with Sodium Hydroxide.

It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from exposure to the light, as it has a tendency to acquire a pinkish tint. It is described in the *U.S.P.* as a diatomic Phenol and under the title of Resorcinol. On this account care should be taken not to confound it with the proprietary preparation known also under the name of Resorcinol, which is described below and which is a mixture of equal parts of Iodoform and Resorcin.

Solubility.—4 in 3 of Water; 4 in 3 of Alcohol (90 p.c.); 1 in 1 of Glycerin; 1 in 1 of Ether; 1 in 22 of Olive Oil.

Medicinal Properties.—A powerful antiseptic. It is also antipyretic, but it is very depressing to the heart, and is dangerous. As a **spray** (1 or 2 p.c.) in diphtheria and whooping-cough, *Pr.* liv. 381; 5 to 10 p.c. **solutions** in Glycerin; 5 to 10 p.c. **ointments** in skin diseases, *B.M.J.* '88, i. 435; *L.* '88, i. 570; '90, ii. 1347; '91, ii. 505, 1185; *T.G.* '90, 279. In acne rosacea, *Pr.* li. 380; in pruritus, *M.A.* '95, 436; in diarrhœa and gastric affections, and as a local germicide and stimulant in ulcers and in pharyngitis and chronic rhinitis, *Y.B.T.* '94, 463; in leucoplakia, *T.G.* '95, 181. Untoward effects when administered internally as a powder, *L.* '98, ii. 779, 836; internal administration of 3 grains taken every 4 hours, followed by appearance of Phenol-sulphates in the urine and kidney disturbance.—*B.M.J.* '01, ii. 1266. A watery solution of about 5 grains to the oz., combined with a little alkali employed as a spray, is recommended (*B.M.J.* '05, ii. 1680) in the treatment of common cold in the head, and as a mouth and nasal spray in influenza.—*Pr.* '07, i. 152.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

Prescribing Notes.—*It is frequently prescribed in hair lotions and washes for removing dandruff, but when mixed with an alkali, e.g., Potassium Carbonate, the solutions rapidly darken in colour and acquire a strong green fluorescence, and such lotions frequently produce an unpleasant colouring effect on the hair which, once produced, is somewhat difficult to remove. It is also incompatible with Spiritus Ætheris Nitrosi.*

Antidotes.—White of Egg; wash out the stomach with Soda or Saccharated Lime, well diluted; stimulants; Atropine; Amyl Nitrite.—*Murrell.*

In large doses it produces profuse perspiration, flushing of the face, and giddiness. Dr. Murrell describes a case of poisoning by 2 drm. of it which nearly proved fatal.—*M.T.* '81, ii. 487.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Russ. Span., Swed., Swiss and U.S.

Tests.—Resorcin melts, when pure, at 118° to 119° C. (244·4° to 246·2° F.), volatilising completely at a higher temperature. The *U.S.P.* gives 109° to 111° C. (228·2° to 231·8° F.); the *Fr. Codex* (1908) 119° C. (246·2° F.). It boils at 276° C. (528·8° F.). The *U.S.P.* gives the boiling point 276·5° C. (529·7° F.). It dissolves readily in Water, forming a clear solution, which is neutral in reaction towards Litmus paper, and which yields, on the addition of Ferric Chloride T.S., a deep violet colour, which changes to a brownish-yellow on the addition of Ammonia Solution. On gently warming 0·05 of a gramme with 0·1 of a gramme of Tartaric Acid and 10 drops of Sulphuric Acid a deep carmine-red liquid is obtained. 0·5 of a gramme, when mixed with 2 c.c. of Formalin Solution and 2 c.c. of Potassium Hydroxide Solution (5 p.c.), and the mixture heated to boiling, a deep red coloration is gradually developed.

The more generally occurring impurities are Catechol, Quinol, empyreumatic bodies, Phenol, and mineral impurities. Catechol gives, with Ferric Chloride T.S., a dark green coloration changing to violet-red on the addition of Ammonia Solution, which distinguishes it from Resorcin. Quinol forms green crystals of Quinhydrone on the addition of Ferric Chloride T.S., changing to yellow, sparingly soluble Quinone on the addition of an excess of the reagent. It also yields a white precipitate with neutral Lead Acetate Solution, whereas a solution of Resorcin yields no precipitate; Lead Subacetate Solution produces, however, a white precipitate in an aqueous solution of the salt. The concentrated aqueous solution should be colourless, indicating the absence of empyreumatic bodies, and no odour of Phenol should be emitted when the concentrated solution is gently heated. When ignited with free access of air it should leave no weighable residue.

Preparations.

GARGARISMA RESORCINI.—20 grains to 1 fl. oz. Water.—*Throat.*

GLYCERINUM RESORCINI.—Resorcin 1, Distilled Water 1, Glycerin, 3.—*Guy's.*

LOTIO RESORCINI (Andeer's Lotion).—Resorcin 40 grains, Water 1 fl. oz. Used as an antiseptic and stimulant in foul and syphilitic ulcerations, and to allay irritation in chronic eczema and psoriasis.

This has been incorporated in the *B.P.C.*

PASTA RESORCINI FORTIOR (*Lassar*).—Resorcin 20, Zinc Oxide 20, Powdered Starch 20, Liquid Paraffin 40.

This has been incorporated in the *B.P.C.*

PASTA RESORCINI MITIS (*Lassar*).—Resorcin 10, Zinc Oxide 25, Powdered Starch 25, Liquid Paraffin 40.

This has been incorporated in the *B.P.C.*

PASTA ZINCI C. RESORCINO (*Ihle's Paste*).—Resorcin 10 grains; Zinc Oxide, Powdered Starch, Soft Paraffin and Wool Fat, of each, 120 grains.—*Middlesex.*

This has been incorporated in the *B.P.C.* under the title **Unguentum Resorcini cum Amylo**, with the synonym as above.

PIGMENTUM RESORCINI.—Resorcin 96 grains, Glycerin of Borax to 1 fl. oz.—*Throat.*

RESORCIN PLASTER MULL (*Unna*).—Contains ¾ grain to the square inch.

SPIRITUS CAPILLARIS (*Unna*).—Resorcin 60 grains, Castor Oil ½ fl. drm., Eau de Cologne 1½ fl. oz., Rectified Spirit to 6 fl. oz.

Spiritus Resorcini. *Syn.* Spiritus Capillaris; Spiritus Capillorum; Lotio Resorcini Composita.—Resorcin, 2·50; Castor Oil, 2·50; Cologne Spirit, 20; Alcohol, *q.s.* to produce 100.—*B.P.C.*

UNGUENTUM RESORCINI.—Resorcin 60 grains, Glycerin 1 fl. drm., Lanolin 2 drm., Soft Paraffin to 1 oz.—*London.*

This has been incorporated in the *B.P.C.* as follows:—Resorcin, 12·50; Glycerin, 12·50; Hydrous Wool Fat, 25; Soft Paraffin, *q.s.* to produce 100.

UNGUENTUM RESORCINI COMPOSITUM.—Resorcin, 8; Distilled Water, 8; Oil of White Birch, 8; Oxide of Zinc, 8; Vaseline, 32; Anhydrous Lanolin, 32. Dissolve the Resorcin in the Water and mix with the other ingredients.—*Bournemouth Formulary.*

This has been incorporated in the *B.P.C.* with slight modification.

TRIBROMO-RESORCIN.—Minute, white or whitish crystals. It is a powerful antiseptic and bactericide.—*P.J.* '99, ii. 216.

Resorcini Monacetas (Euresol).—A transparent yellow viscous mass, readily soluble in Acetone.

RESORCIN CAMPHOR.—A liquid obtained by heating together equal parts of Camphor and Resorcin. Is superior to mercurial ointment in removing pediculi.—*P.J.* '96, i. 229, 326.

RESORCINOL.—Obtained by melting together equal volumes of Resorcin and Iodoform. It is a red-brown powder, partially soluble in Water, soluble in Ether. Has been introduced as a substitute for Iodoform as a dressing.—*P.J.* '96, i. 446.

ANUSOL (Bismuth Iodo-resorcin-sulphonate) is employed in suppository form in the treatment of piles.—*P.J.* '96, ii. 378.

FLUORESCEIN (Resorcinol-Phthaleïn Anhydride).—An amorphous yellowish-red powder; almost insoluble in Water, in Alcohol (90 p.c.), and in Ether, Prepared by the action of Phthalic Anhydride on Resorcin. It dissolves readily in solutions of the alkali hydroxides, *e.g.*, Sodium Hydroxide, forming **Sodium Fluorescein**, a yellowish or greyish-red powder readily soluble in Water. In the form of a 2 p.c. solution it has been used for staining the denuded spots of the cornea, and has thus been found useful in the diagnosis of corneal ulcers.

LIQUOR FLUORESCEIN.—Fluoresceïn 8 grains, Sodium Bicarbonate 12 grains, Distilled Water 1 fl. oz.—*London Ophthalmic.*

Not Official.

RHAMNI FRANGULÆ CORTEX.

Syn.—CORTEX FRANGULÆ.

The dried Bark of *Rhamnus Frangula*, L. Collected from the young Trunk and from the larger Branches, and kept at least one year before being used.

Official in *B.P.* 1885, but not in *B.P.* 1898.

Medicinal Properties.—Similar to those of Rhamnus Purshianus. A laxative or purgative for delicate constitutions and the aged.

A solid **Extract,** dose, 15 to 60 grains, was official in *B.P.* '85, and is now in Dutch, Russ. and Swed.; a **Fluid Extract,** dose, 1 to 4 fl. drm., was official in *B.P.* '85, and is now in Dan., Dutch, Fr., Ger., Norw., Russ., Swed., Swiss and U.S.; Swed. also has a **Syrup.** Fructus Rhamni Catharticæ is official in Belg. and Ger., also the **Syrup.**

Descriptive Notes.—The bark as found in commerce is a waste product, being derived from the wood known in trade as 'dogwood,' which is imported from Holland for use as gunpowder. The thin bark of the younger trunks and branches is preferable for use in medicine, the thicker bark of old trees being very bitter and nauseous. It requires to be kept a year before being used like that of *R. Purshianus*, the recently collected bark being liable to produce colic, nausea, and vomiting. The dried bark is in the form of thin quills of a dark greyish-brown or greenish-black colour externally, and has a brownish-yellow inner surface. It should not exceed $\frac{1}{25}$ inch (1 mm.) in thickness. The outer surface is covered with numerous elongated, transverse, whitish marks (lenticels); when the epidermis is abraded with the nail, a purplish-red or dull crimson layer is seen beneath, which forms a characteristic feature of the bark. It does not contain stone cells.

Preparations.

EXTRACTUM RHAMNI FRANGULÆ.—Rhamnus Frangula Bark, in No. 40 powder, is percolated with Proof Spirit (Alcohol 57 p.c.) until exhausted, the liquor is evaporated by a water-bath to an extract.—*B.P.* 1885.

The *B.P.C.* employs the Bark in No. 20 powder, and exhausts by percolation with Water.

EXTRACTUM RHAMNI FRANGULÆ LIQUIDUM.—Boil 16 of the Bark in successive quantities of Water; evaporate the liquors to 12, and when cold add 4 of Rectified Spirit, filter, and add Water *q.s.* to make 16.—*B.P.* 1885.

FLUIDEXTRACTUM FRANGULÆ.—Percolate 100 of Bark with a mixture of 50 of Alcohol (95 p.c.), with 80 of Water, reserve the first 80, and evaporate the remainder to a soft extract, which dissolve in the reserved portion and make up to 100.—*U.S.P.*

Average Dose.—15 minims = 0·9 c.c.
This has been incorporated in the *B.P.C.*

RHEI RADIX.

RHUBARB ROOT.

FR., RHUBARBE DE CHINE; GER., RHABARBER; ITAL., RABARBARO;
SPAN., RUIBARBO.

Though called Rhubarb Root, it really consists chiefly of the erect Rhizomes of *Rheum palmatum*, L., *R. officinale*, Baill., and probably other species, collected in North-Western China and Tibet.

Medicinal Properties.—Cathartic and astringent; the purgative effect precedes the astringent, and therefore Rhubarb is useful in diarrhœa when an aperient is indicated. Stomachic tonic in small doses. Given in dyspepsia, and in occasional but not in chronic constipation. It is non-irritant, suitable for delicate constitutions, and for increasing the effect of other cholagogues and cathartics; useful in hæmorrhoids. It is frequently combined with an antacid or carminative.

Dose.—3 to 10 grains = 0·2 to 0·65 gramme, for repeated administration; for a single administration, 15 to 30 grains = 1 to 2 grammes.

Prescribing Notes.—*May be given in* **cachets, pills, mixtures,** *or Compressed Tablets. The* **compound powder** *is also prescribed in* **cachets, capsules,** *etc.*

4 *grains of Powdered Rhubarb and* 1 *minim of 'Dispensing Syrup' make a nice* **pill.** *Sodium Bicarbonate in equal weight with Powdered Rhubarb counteracts the astringency, and covers the taste; the addition of Peppermint Water still further hides it; or* 1 *drop of Oil of Peppermint,* 30 *grains of Sugar, will disguise the taste of* 15 *grains of Powdered Rhubarb; or* 1 *drop of Oil of Caraway,* 30 *grains of Sugar, and* 10 *grains of Powdered Rhubarb, make a good* **draught** *with Water to* 1½ *fl. oz.*

Official Preparations.—Extractum Rhei, Infusum Rhei, Liquor Rhei Concentratus, Pilula Rhei Composita, Pulvis Rhei Compositus, Syrupus Rhei, Tinctura Rhei Composita.

Not Official.—Elixir Rhei, Extractum Rhei Compositum, Fluidextractum Rhei, Infusum Rhei Concentratum, Pulvis Rhei cum Magnesia, Mistura Rhei cum Soda, Pilula various, Pulveres various, Tinctura Rhei Aquosa, Vinum Rhei, Purgatin and Rumicin.

Foreign Pharmacopœias.—Official in all.

Descriptive Notes.—The official Rhubarb Root is attributed to *Rheum palmatum*, Linn., *Rheum officinale*, Baill., and probably other species (*Rheum palmatum* var. *Tanguticum Max., U.S.P.*), and is stated to be collected in China and Tibet. The official description covers several varieties. The Chinese Rhubarb Root of commerce occurs either in transverse sections or split longitudinally, it varies in length and diameter, but averages 3 to 4 in. long and 2 to 3 in. broad, although pieces are sometimes met with as much as 6 or 8 in. long and broad in proportion. The outer surface is convex from having been scraped, or sometimes angular from having been sliced, and presents here and there stellate markings, due to the transversely cut medullary rays of lateral buds or of roots. The outer surface is brownish-yellow, but the broken surface pinkish-brown or greyish-brown; the substance is tough and hard, and gritty when chewed. The taste is bitter and astringent, and the flavour disagreeable. Although the root of *Rheum officinale* is cultivated in England, only that collected in China and Tibet is official. The Shensi Rhubarb is considered the best, that of Sechuen and Kansuh are less valuable. The drug, which is produced chiefly in the provinces of Shensi, Sechuen and Kansuh, finds its way to Europe usually *viâ* Hankow, Shanghai and Canton, although the drug is also produced in other provinces and in Manchuria. The Shensi Rhubarb exhibits, mostly on the lighter and less compact pieces, a rhomboidal network of whitish veins, but none of the known species of Rheum possess this character, so that it is evidently derived from an undescribed species. In commerce the pieces formed by dividing the rootstock longitudinally are known as 'flats' and those cut transversely as 'rounds.' 'High dried' Canton Rhubarb has usually been dried by artificial heat, and when prepared in this way the pieces are apt to become rotten in the centre, hence, as a test of quality, transversely broken pieces are usually exhibited at the drug sales. The hardest and heaviest pieces are usually selected for trimming, which is done by filing. The English cultivated Rhubarb, prepared from *R. rhaponticum*, L., is less gritty than the Chinese and is less active as a purgative, but it gives a brighter yellow powder. The *R. officinale* grown in England is distinguishable from that of *R. rhaponticum* by its larger size and by the dark or blackish-red veins traversing it as compared with the reddish-brown veins of the latter species, which usually form more or less parallel lines on the longitudinal section, and radiate lines on the transverse one. In the Chinese Rhubarb, except in the very inferior kinds, the bark is entirely removed; the holes, through which the string is used for suspending the roots in drying, are dark coloured and irregular, and the outer surface of the pieces is convex. In English Rhubarb, which is always dried by stove heat, the outer surface is denuded of the outer layer only, and is always more or less shrunken and irregular, the internal portion is soft and can be easily indented, and the holes, when present, are round and have fresh edges, having been made with a rat-tail file to imitate the Chinese drug. The larger pieces of the English Rhubarb are mostly exported to the United States; the lateral roots, known as 'stick Rhubarb,' are sold at a cheap rate by herbalists. The powdered English Rhubarb, apparently from containing or absorbing more moisture, is liable to turn pink when mixed with Magnesia to form Gregory's Powder. In making aqueous preparations of Rhubarb, the use of pieces cut small, rather than coarsely powdered, gives brighter preparations, which are more easily filtered. The raphides being more abundant in Chinese Rhubarb than in English, the percentage of ash affords some indication of the kind used for the powder, that of Chinese Rhubarb yielding according to Hanbury 12·9 to 13·87 p.c. of ash, one sample, however, yielding as much as 43·27 p.c. English Rhubarb afforded 10·90 p.c. of ash.

The *P.G.* mentions that the sphæraphides measure up to 0·1 mm. and the roundish starch grains from 0·003 to 0·018 mm. (0·005 to

0·020 mm. *U.S.P.*) which are either simple or grouped two or three together and have an evident hilum.

Tests.—The ash of Rhubarb Root varies from 7 to 12 p.c. 12 samples of picked root examined in the author's laboratory yielded from 4·1 to 21·5 p.c., with an average of 9·85; 14 samples of the powder yielded from 6·7 to 12·1 p.c., with an average of 8·97.

Preparations.

EXTRACTUM RHEI. EXTRACT OF RHUBARB.

Rhubarb Root, exhausted with Alcohol (60 p.c.), and the resulting liquor evaporated to dryness.

Dose.—2 to 8 grains = 0·13 to 0·52 gramme.

Official in Austr., Dutch, Ger., Jap., Norw., Swed., Swiss and U.S., with Spirit and Water mixed; Belg., with Alcohol (60 p.c.); Dan., with Alcohol (70 p.c.); Fr., Hung., Ital., Mex., Port., Russ. and Span., with Water.

Mex. and U.S. have also a **Fluid Extract,** 1 in 1; Belg., Fluid Extract containing 30 p.c. of dry residue.

INFUSUM RHEI. INFUSION OF RHUBARB.

Rhubarb Root, in thin slices, 1; boiling Distilled Water, 20. Infuse 15 minutes; strain. (1 in 20)

Now 1 in 20 instead of 1 in 40, and the time is reduced.

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.

Foreign Pharmacopœias.—Official in Belg., Fluid Extract 10, Potassium Carbonate 1, Cinnamon Water 89; Dan., Rhubarb 125, Sodium Carbonate 25, Distilled Water 2000, Concentrated Spirit 125, Cinnamon Water 150; Ital., Rhubarb 3, Sodium Carbonate 1, Water 50; Norw., Rhubarb 25, Sodium Bicarbonate 3, Distilled Water 170, Cinnamon Water 30; Swed., Rhubarb 10, Sodium Carbonate 2, Alcohol (64 p.c.), *q.s.*, Distilled Water, *q.s.* to make 100; all Infusum Rhei Alcalinum. Fr. (Tisane de Rhubarbe), Rhubarb 5, Distilled Water 1000; Span. (Infusion de Ruibarbo), Rhubarb 2, Water 50. *See* also Tinctura Rhei Aquosa, p. 1017.

LIQUOR RHEI CONCENTRATUS. CONCENTRATED SOLUTION OF RHUBARB.

10 of Rhubarb Root, percolated with Alcohol (20 p.c.), to yield 20. (1 in 2)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Tests.—Concentrated Solution of Rhubarb has a sp. gr. of 1·020 to 1·030; it contains about 12 p.c. w/v of total solids and about 18 p.c. w/v of Absolute Alcohol.

PILULA RHEI COMPOSITA. COMPOUND RHUBARB PILL.

Rhubarb Root, 3 oz.; Socotrine Aloes, 2¼ oz.; Myrrh, 1½ oz.; Hard Soap, 1½ oz.; Oil of Peppermint, 1½ fl. drm.; Syrup of Glucose (by weight), about 2¾ oz.

Dose.—4 to 8 grains = 0·26 to 0·52 gramme.

5 grains = about 1⅓ grain of Rhubarb and 1 grain of Aloes.

Official in Jap., Swiss and U.S.

PULVIS RHEI COMPOSITUS. COMPOUND POWDER OF RHUBARB. *B.P.Syn.*—GREGORY'S POWDER.

Rhubarb Root, 2; Light Magnesia, 6; Ginger, 1. (1 in 4½)

If a less bulky powder be desired, Heavy Magnesia is officially permitted to be employed.

Dose.—20 to 60 grains = 1·3 to 4 grammes.

Foreign Pharmacopœias.—Official in Austr., Magnesium Carbonate 4, Rhubarb 2, Elæosaccharum Fœniculi 4; Dan., Norw. and Swed., Magnesium Carbonate 1, Rhubarb 1, Elæosaccharum Fœniculi 1; Ger. and Jap., Magnesiæ cum Carbonate 10, Rhubarb 3, Elæosaccharum Fœniculi 7; Russ., Magnesium Carbonate 4, Rhubarb 1, Elæosaccharum Fœniculi 2; all Pulvis Magnesiæ cum Rheo. Jap. has also Pulvis Rhei Compositus, Rhubarb 2, Burnt Magnesia 6, Ginger 1. Swiss (Pulvis Magnesiæ Compositus), Magnesium Carbonate 5, Rhubarb 2, Elæosaccharum Fœniculi 3; U.S. (Pulvis Rhei Compositus), Rhubarb 25, Magnesium Oxide 65, Ginger 10.

Pulvis Rhei cum Magnesia. *Syn.* Improved Gregory's Powder.—Rhubarb Root, in powder, 22; Magnesium Carbonate, 66; Ginger, in powder, 11. —*B.P.C.*

SYRUPUS RHEI. SYRUP OF RHUBARB.

Rhubarb Root, 1; Coriander Fruit, 1; Refined Sugar, 12; Alcohol (90 p.c.), 4; Distilled Water, 12; should yield about 20 by weight.

B.P. directions are not very satisfactory. It is more convenient to make a (1 in 4) fluid Extract of Rhubarb with Alcohol (60 p.c.); evaporate 8 fl. oz. of the fluid Extract to 3 fl. oz.; mix this and 5 minims of Oil of Coriander with 24 oz. of Sugar, and add Water to make the weight 40 oz.; dissolve in the cold, and filter.

Dose.—$\frac{1}{2}$ to 2 fl. drm. = 1·8 to 7·1 c.c.

Foreign Pharmacopœias.—Official in Austr., Rhubarb 10, Borax 2, Spirits of Wine, diluted, 10, Water 90; after 24 hours filter, and to 10 of filtrate add 16 of Sugar; Dutch, Rhubarb 30, Sodium Carbonate 3, Water 180; to 150 of liquid add 248 of Sugar; Ger., Jap. and Russ., Rhubarb 10, Potassium Carbonate 1, Borax 1, Water 80; to 60 of filtrate add 20 of Cinnamon Water and 120 of Sugar; Swiss, Rhubarb 10, Potassium Carbonate 1, Borax 1, Tincture of Cinnamon 12, Simple Syrup 176; Hung., Rhubarb 20, Sodium Carbonate 4, Diluted Spirit 20, Cold Water a sufficiency; to 200 of filtrate add 340 of Sugar; Ital. (Sciroppo di Cicoria con Rabarbaro), Rhubarb 1, Juice of Chicory Leaves 12, Sugar 16; Swed., Rhubarb 5, Sodium Carbonate 1, Water a sufficiency; after filtration add to 37 of filtrate 63 of Sugar; Port. (Xarope de Rhuibarbo), Rhubarb 5, Water 35, Sugar 65; Mex. (Jarabe de Achicoria y Ruibarbo), Extract of Rhubarb 25, Simple Syrup 975; Belg., Fluid Extract of Rhubarb 50, Potassium Carbonate 5, Cinnamon Water 30, Simple Syrup 915; U.S., Fluid Extract 100, Spirit of Cinnamon 4, Potassium Carbonate 10, Water 50, Syrup to make 1000. All by weight except U.S.

Fr. has a Compound Syrup, and U.S. has also Syrupus Rhei Aromaticus.

TINCTURA RHEI COMPOSITA. COMPOUND TINCTURE OF RHUBARB.

Rhubarb Root, 2; Cardamom Seeds, $\frac{1}{4}$; Coriander Fruit, $\frac{1}{4}$; Glycerin, 2; Alcohol (60 p.c.), *q.s.* to yield 20. (1 in 10)

B.P. 1885 contained Saffron, but no Glycerin.

Dose.—$\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c. for repeated administration; for a single administration, 2 to 4 fl. drm. = 7·1 to 14·2 c.c.

Foreign Pharmacopœias.—Official in Austr. (Tinctura Rhei Vinosa) and Hung. (Tinctura Rhei Darelli), Rhubarb 10, Orange Peel 2, Cardamom Seeds 1, Malaga Wine 100; in 100 of filtrate dissolve 15 of Sugar; Dutch (Vinum Rhei), Rhubarb 9, Cardamom 1, Malaga Wine 100; Ger. (Tinctura Rhei Vinosa), Rhubarb 8, Orange Peel 2, Cardamom 1, Sherry 100; filter, and in the filtrate dissolve a seventh part of Sugar; Jap. (Tinctura Rhei), Rhubarb 10, Cassia 1, Cardamom 1, Alcohol 50, Distilled Water 50; Norw. and Swed. (Tinctura Rhei Amara), Rhubarb 10, Gentian Root 4, Cardamom 1, Alcohol (64 p.c.), 100; Russ. (Tinctura Rhei Vinosa), Rhubarb 8, Orange Peel 2, Cardamom 1, Sherry 100, Sugar 12; Swiss (Vinum Rhei Compositum), Rhubarb 8, Orange Peel 2, Cardamom 1, Vinum Meridianum Dulce 100; U.S. (Tinctura Rhei), Rhubarb 20, Cardamom 4, Glycerin 10, Alcohol and Water, each *q.s.* to make 100; also (Tinctura Rhei Aromatica), Rhubarb 20, Saigon Cinnamon 4, Cloves 4, Nutmeg 2, Glycerin 10, Alcohol and Water, each *q.s.* to make 100. All by weight except U.S.

Belg., Fr., Ital. and Mex. have a Simple Tincture, Rhubarb 1, Alcohol (60 p.c.) 5; Port., Rhubarb 1, Alcohol (65 p.c.) 5.

See also Tinctura Rhei Aquosa, given under Infusum Rhei.

Tests.—Compound Tincture of Rhubarb has a sp. gr. of 0·970 to 0·975; it contains about 15 p.c. w/v of total solids and about 50 p.c. w/v of Absolute Alcohol.

Not Official.

ELIXIR RHEI.—Rhubarb Root, in No. 12 powder, 5; Fennel Fruit, bruised, 2; Glycerin 3; Refined Sugar 4; a mixture of Alcohol (90 p.c.) 1, and Distilled Water 3, *q.s.* to produce 20.—*B.P.C. Formulary* 1901, now incorporated in the *B.P.C.* with the *syn.* Liquor Rhei Dulcis.

Dose.—1 to 3 fl. drm. = 3·6 to 10·6 c.c.

EXTRACTUM RHEI COMPOSITUM.—Ext. Rhei 3, Ext. Aloes 1, Resina Jalapæ ½, Soap 2.—*Ger.*

Extract of Rhubarb 6, Extract of Aloes 2, Jalap Resin 1, Soap 1.—*Austr.*, *Dutch* and *Swiss.*

Extract of Rhubarb 6, Extract of Barbados Aloes 2, Jalap Resin 1, Hard Soap 1.—*B.P.C.*

FLUIDEXTRACTUM RHEI.—100 of Rhubarb, in No. 30 powder, macerated in and subsequently percolated with a mixture of Alcohol (95 p.c.) 80, and Water 20; reserve the first 75 of the percolate, and evaporate the remainder to a soft extract, which mix with the reserved portion and make up with the menstruum to 100.—*U.S.P.*

Average Dose.—15 minims = 0·9 c.c.

This has been incorporated in the *B.P.C.*

INFUSUM RHEI CONCENTRATUM.—Rhubarb, in No. 10 powder, 40; Alcohol (90 p.c.), 25; Dilute Chloroform Water (1 in 1000), *q.s.* to make 100. —*Farr* and *Wright*, *P.J.* '06, i. 165 and '07, i. 622; *C.D.* '06, i. 252; *Y.B.P.* 1907, 250. Prepare by repercolation.

This appears in the *B.P.C.*

MISTURA RHEI CUM SODA.—Rhubarb Root, in powder, 5 grains, Sodium Bicarbonate 10 grains, Caraway Water to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

Mistura Rhei et Sodæ.—Sodium Bicarbonate 3·5, Fluid Extract of Rhubarb 1·5, Fluid Extract of Ipecac. 0·3, Glycerin 35, Spirit of Peppermint 3·5, Water *q.s.* to make 100.—*U.S.P.*

PILULA RHEI ET COLOCYNTHIDIS ET HYDRARGYRI.—Compound Rhubarb Pill 1 grain, Compound Colocynth Pill 1 grain, Mercury Pill ½ grain in each pill.—*B.P.C.*

PILULA RHEI ET NUCIS VOMICÆ.—Compound Rhubarb Pill 3 grains, Extract of Nux Vomica ¼ grain, Alcoholic Extract of Belladonna ⅛ grain in each pill.—*St. Thomas's.*

The *B.P.C.* use the same formula as above, the quantities being 2⅛ grains, ¼ grain, ⅛ grain, respectively, with Milk Sugar to make a 4-grain pill.

PULVIS RHEI CUM HYDRARGYRO.—Rhubarb Root, in powder, 2 grains, Mercurous Chloride ⅓ grain, Ginger, in powder, ½ grain; dose for a child 12 months old.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

PULVIS HYDRARGYRI ET RHEI.—Rhubarb, in powder, 3, Mercury with Chalk 1, Sodium Bicarbonate 3.—*St. Mary's.*

Pulvis Rhei cum Hydrargyro et Soda. *Syn.* Baird's Aperient Powder. —Rhubarb Root 50, Mercury with Chalk 16·50, Sodium Bicarbonate *q.s.* to produce 100. Dose.—6 to 12 grains.—*B.P.C.*

PULVIS RHEI CUM SODA.—Rhubarb Root, in powder, 1 grain, Sodium Bicarbonate 2 grains; dose for a child 12 months old.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

TINCTURA RHEI AQUOSA.—Rhubarb 10, Potassium Carbonate 1, Sodium Borate 1, Boiling Distilled Water 90, Alcohol 9; after the lapse of an hour strain the solution by applying a slight pressure; with every 85 parts of the strained liquid mix Cinnamon Water 15. Prepare freshly when required.—*Ger.* and *Jap.*

This has been incorporated in the *B.P.C.*

Austr., Rhubarb 10, Borax 3, Spirits of Wine Diluted 20, Cold Water 80.

Dutch, Rhubarb 10, Sodium Carbonate 2, Cinnamon Water to produce 100.

Hung., Rhubarb 10, Sodium Carbonate 2, Cold Distilled Water 160, Alcohol (70 p.c.) 10.

Russ., Rhubarb 10, Borax 1, Potassium Carbonate 1, Distilled Water Ebullientis 85, Spirits of Wine (90 p.c.) 10, Cinnamon Water 15.

Swiss, Liquid Extract 10, Borax 1, Potassium Carbonate 1, Alcohol 8, Cinnamon Water 20, Water 60.

VINUM RHEI.—Rhubarb Root, in coarse powder, 1½ oz., Canella Bark 60 grains, Sherry 20 fl. oz.—*B.P.* 1885, *omitted in* 1898.

This has been incorporated in the *B.P.C.*, employing Detannated Sherry.

Official in Belg., 1 of Fluid Extract in 20.

PURGATIN, PURGATOL (Anthrapurpurin Diacetate).—A yellow, or brownish-yellow, micro-crystalline powder, insoluble in Water, sparingly soluble in Alcohol (90 p.c.). Introduced as a synthetic purgative belonging to the series of oxyanthraquinones.

Useful in chronic constipation occurring along with neurasthenia, hypochondria, or hæmorrhoids, where it is appropriately employed in place of Rhubarb and Aloes.

Rumicin, a dried extract from the Root of *Rumex crispus*, has been used as an eclectic preparation. It has properties similar to Rhubarb; dose, 1 to 5 grains = 0·06 to 0·32 gramme.

It must not be confounded with the crystalline substance Rumicin, which is allied to Chrysophanic Acid.

RHŒADOS PETALA.

RED-POPPY PETALS.

FR., COQUELICOT; GER., KLATSCHROSENBLUMEN; ITAL., ROSOLACCIO; SPAN., AMAPOLA.

The bright scarlet-coloured, fresh Petals of *Papaver Rhœas*, L., possessing a peculiar narcotic odour and a mucilaginous bitter taste.

Chiefly used as a colouring agent.

Official Preparation.—Syrupus Rhœados.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch; Fr. (Coquelicot); Mex. and Span. (Amapola); Swiss.

Descriptive Notes.—The fresh petals of *Papaver Rhœas* are Official. There are several forms or allied species, all with red petals, but differing in the size of the flower and the shape and hairiness of the ovary, as well as in the shape of the leaf segments. One of these has a purplish-black spot at the base of each petal, but the scarlet colour of the petal is deeper than that of other forms, and this variety gives a deeper coloured syrup. The petals of the typical plant are crumpled when freshly unfolded, about 1½ to 2 in. (4 to 5 cm.) broad, and of a bright red colour. They have a slightly bitter taste and characteristic odour.

Tests.—Red-Poppy Petals contain about 16 p.c. of ash.

Preparation.

SYRUPUS RHŒADOS. SYRUP OF RED-POPPY.

Dissolve (with heat) 36 of Sugar in a strained infusion of Red-Poppy Petals, 13, in Distilled Water, 20; preserve with 2½ of Alcohol (90 p.c.); total weight should be 58. (1 in 3½)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

This syrup is particularly liable to fermentation, and is therefore preserved by the addition of Alcohol (90 p.c.). In India and the Colonies the Alcohol may be increased up to twice the quantity ordered in the formula.

Foreign Pharmacopœias.—Official in Dutch and Mex.

Not Official.

RHUS TOXICODENDRON.

POISON IVY.

The fresh Leaves of *Rhus radicans*, L., were official in *U.S.P.* 1890; and a **Tincture** from them is given in doses of 1 to 5 minims for rheumatism. **Fluid Extract** (1 in 1) is also made.

Recently (August, 1908) attention has been called to the poisonous character of this plant, and that it produces an eruption in persons handling it; an alcohol solution of Lead Acetate applied to the rash affords speedy relief.—*P.J.* '08, ii. 232, 271.

Rhus glabra, L., (*U.S.*) and *Rhus aromatica*, Ait., have been used as tonics and astringents; given for nocturnal incontinence of urine. Both these can be supplied as **Fluid Extracts** (1 in 1); doses, 5 to 10 minims = 0·3 to 0·6 c.c.

RICINI OLEUM.

CASTOR OIL.

FR., HUILE DE RICIN; GER., RICINUSÖL; ITAL., OLIO DI RICINO;
SPAN., ACEITE DE RICINO.

A colourless, or pale yellow, almost odourless, thick viscid fluid, possessing at first a mild and subsequently somewhat nauseous taste; expressed from the Seeds of *Ricinus communis*, L.

It should be kept in well-closed vessels and protected as far as possible from exposure to the air, as it has a tendency to gradually thicken.

Ricinoleic Acid is stated to be the active principle. The Seeds contain a toxic phytalbumose, **Ricin**, which is extremely poisonous; it is not contained in the Oil.

Solubility.—Entirely soluble in all proportions of Absolute Alcohol, Ether, Oil of Turpentine and Glacial Acetic Acid; 1 in 3½ of Alcohol (90 p.c.).

Medicinal Properties.—A mild and speedy cathartic. It is the best purgative in constipation from indurated fæces, or after swallowing acrid substances. Used in diseases attended with irritation or inflammation of the bowels, as colic, and diarrhœa due to indigestible food, dysentery and the constipation of typhoid fever; the most suitable purgative after parturition, during pregnancy and after abdominal operations. The safest cathartic for infants, to whom a larger relative dose than to adults may be given; relieves infantile intestinal spasms. It may be administered in an enema with some mucilaginous or oily fluid.

Dropped into the eye, it soothes the irritation caused by a foreign body.

The decoction of the leaves of *Ricinus* applied to the breast is said to produce an abundant secretion of milk.

Dose.—1 to 8 fl. drm. = 3·6 to 28·4 c.c.

Prescribing Notes.—*In* **draught** *suspended with mucilage of Gum Acacia, or in* **capsules** (*see below*).

One of the least disagreeable modes of taking Castor Oil is to pour it on to some Milk or Cream contained in a wine-glass, the interior and edges of which have been moistened with the latter.

It is used as a solvent for alkaloidal bases in ophthalmic practice.

In the treatment of dysentery (*I.M.G.* '05, ii. 249, 280), 1 oz. of the Oil, with 30 minims Tincture of Opium and Milk diet.

In infantile diarrhœa administered in small repeated doses. A formula which has been found convenient is Oleum Ricini, 10 minims; Tincture of Rhubarb, 5 minims; Glycerin, 5 minims; Tragacanth, ½ grain; Peppermint Water, to 1 oz. 1 drm. to be given every 4 hours for the first 36 hours, and then less frequently.—*Pr.* lxxv. 507.

Official Preparation.—Mistura Olei Ricini. Contained in Collodium Flexile, Linimentum Sinapis, and Pilula Hydrargyri Subchloridi Composita.

Not Official.—Capsules of Castor Oil, Emulsio Olei Ricini, Mistura Olei Ricini, Enema Olei Ricini, and Oleum Ricini Aromaticum.

Foreign Pharmacopœias.—Official in all.

Tests.—Castor Oil has a sp. gr. of 0·960 to 0·968. The *B.P.* states from 0·950 to 0·970. Good medicinal samples of the Oil never possess so low a gravity as 0·950. The *U.S.P.* gives the gravity of 0·945 to 0·965 at 25° C. (77° F.); the *P.G.* 0·950 to 0·970. Ten good medicinal samples of the Oil examined in the author's laboratory had a sp. gr. of 0·960 to 0·966 with an average of 0·963. When cooled to 0° C. (32° F.) a crystalline flocculent deposit settles out, and when reduced to a temperature of about −18° C. (−0·4° F.) it forms a yellowish buttery mass. When exposed to the air it gradually thickens and dries, forming a varnish. The Oil contains a certain proportion of free acid, which may be determined by dissolving a weighed quantity of the Oil (5 grammes) in Alcohol (90 p.c.) 25 c.c., warming and titrating with Tenth-normal Volumetric Sodium Hydroxide Solution. The 10 samples referred to above showed from 1·05 to 3·5 p.c. with an average of 2·1 p.c. The Saponification value of the Oil ranges from 176 to 188. The *U.S.P.* gives 179 to 183; no figure is given in the *P.G.* The above-mentioned

10 samples showed from 176·4 to 187·6, with an average of 182·0. The Iodine absorption of the Oil varies from 85 to 90 p.c., the *U.S.P.* states not less than 84 nor more than 89; no figure is recorded in the *P.G.* The medicinal samples referred to above showed from 85·09 to 90·17, with an average of 87·5.

A determination of the optical rotation of the specimen affords a useful means of judging of its purity; the Oil is dextrogyrate, the optical rotation in a tube of 100 mm. being equal to +4° to +4·5°. The *B.P.* does not make any mention of a determination of free acid, it gives no figures for the Saponification value or for the Iodine absorption, nor does it refer to the optical rotation.

The more generally occurring impurities are fixed Oils other than Castor, such as Cottonseed Oil, Lard Oil, etc. Castor Oil is an exception to the usual characters of the fixed Oils in regard to its solubility in Alcohol. It should dissolve completely in all proportions of Absolute Alcohol, in Glacial Acetic Acid, and in 3½ times its volume of Alcohol (90 p.c.), indicating the absence of more than about 5 p.c. of fixed Oils other than Castor. The *B.P.* gives a test with Sulphuric Acid for detecting the presence of various fixed Oils including Cottonseed, and requires that when 3 c.c. of the Oil are dissolved in 3 c.c. of Carbon Bisulphide, the mixture should not assume a brown colour when shaken with 1 c.c. of Sulphuric Acid; the test is generally considered to be quite unreliable. A useful test for detecting the presence of other fixed Oils is that with Petroleum Ether, but not when carried out as directed in the *B.P.* The latter states that equal volumes of Castor Oil and Petroleum Ether do not yield a clear mixture if kept at 15·5° C. (60° F.), but that they yield a perfectly clear mixture if other fixed Oils be present. The *U.S.P.* description of the test is the more correct; it states that, when mixed with an equal volume of Petroleum Benzin the Oil yields at 17° C. (62·6° F.) a clear solution, but that at 15° C. (59° F.) it forms a turbid mixture. It has been remarked that the monograph requires complete revision, Saponification and Iodine values should be introduced, the Sulphuric Acid test needs revision, if retained, but is of little service.

Carbon Bisulphide and Sulphuric Acid.—If 3 c.c. of the Oil be shaken with 3 c.c. of Carbon Bisulphide and 1 c.c. of Sulphuric Acid, the mixture should not acquire a brown colour, *B.P.*; a blackish-brown colour, *P.G.* and *U.S.P.*

Iodine Absorption.—If 0·3 gramme of the Oil be dissolved in 10 c.c. of Chloroform in a 250 c.c. bottle or flask and 25 c.c. of a mixture of equal volumes of Alcoholic Iodine T.S. and Alcoholic Mercuric Chloride T.S. added, and if after standing for 8 hours protected from light, 20 c.c. of Potassium Iodide T.S. be introduced and the mixture diluted with 50 c.c. of Water, on titrating the excess of Iodine with Tenth-normal Sodium Thiosulphate Volumetric Solution an Iodine value of not less than 84 nor more than 89 should be obtained, *U.S.P.*

Preparation.

MISTURA OLEI RICINI. Castor Oil Mixture.

To 1½ of Mucilage of Gum Acacia add with trituration in small portions alternately, 3 of Castor Oil and a mixture of Orange-Flower Water (undiluted) 1 and Cinnamon Water 2½.

The Oil is now emulsified by means of Mucilage of Gum Acacia in place of saponification with Solution of Potassium Hydroxide, and Cinnamon Water replaces the Oils of Lemon and Cloves.

Dose.—*As a draught*, 1 to 2 fl. oz. = 28·4 to 56·8 c.c.

Not Official.

CAPSULES OF CASTOR OIL.—Flexible capsules containing 30 minims, or 60 minims, in each.

EMULSIO OLEI RICINI.—Castor Oil, ½ fl. oz.; Mucilage of Acacia, ½ fl. oz.; Syrup of Ginger, ¼ fl. oz.; Cinnamon Water, 1 fl. oz.—*Squire.*

Castor Oil, ½ fl. oz.; Yolk of Egg, ¼ fl. oz.; Syrup, ¼ fl. oz.; Peppermint Water, 1 fl. oz.—*Squire.*

Either of these formulas yields a good emulsion.

MISTURA OLEI RICINI. *Syn.* Emulsio Olei Ricini.—Castor Oil, 6 fl. drm.; Mucilage of Gum Acacia, 3 fl. drm.; Orange-Flower Water, 2 fl. drm.; Cinnamon Water, to make 2 fl. oz.—*B.P.C.*

ENEMA OLEI RICINI.—Castor Oil, 2 fl. oz.; Mucilage of Starch, 18 fl. Castor Oil, 1 fl. oz.; Olive Oil, 5 fl. oz.

OLEUM RICINI AROMATICUM.—Gluside, 7½ grains; Sodium Bicarbonate, 7½ grains; Chloroform, 150 minims; Oil of Pimenta, 75 minims; Oil of Cassia, 75 minims; Oil of Cloves, 75 minims; Castor Oil, *q.s.* to make 40 fl. oz.—*Canadian Formulary.*

Amyl Acetate, 0·1; Gluside, 0·15; Alcohol (90 p.c.), 5; Castor Oil, *q.s.* to produce 100.—*B.P.C.*

ROSÆ GALLICÆ PETALA.

RED-ROSE PETALS.

FR., ROSE ROUGE; GER., ESSIGROSE; ITAL., ROSA ROSSA; SPAN., ROSA ROJA.

Dark purplish-red, velvety, claw-shaped petals, possessing a rosaceous odour, and a slightly acidulous, bitter, astringent taste. They usually occur in small, crumpled, conical masses, and are officially described as the fresh and dried unexpanded Petals of *Rosa Gallica*, L., from cultivated plants.

Medicinal Properties.—Used on account of their colouring matter and mild astringency.

Prescribing Notes.—*The Acid Infusion is prescribed with Glycerin of Tannin or Alum as an astringent gargle; it also forms a suitable vehicle for Magnesium Sulphate; the Syrup is used as a colouring agent, and the Confection as a pill excipient. The Nitric Acid Infusion is given with Quinine.*

Official Preparations.—Of the **petals,** Confectio Rosæ Gallicæ, Infusum Rosæ Acidum, and Syrupus Rosæ. The **confection** is contained in Pilula Aloes Barbadensis, Pilula Aloes et Asafetidæ, Pilula Aloes Socotrinæ, and Pilula Hydrargyri.

Not Official.—Fluidextractum Rosæ, Infusum Rosæ cum Acido Nitrico, Infusum Rosæ Acidum Concentratum, Mel Rosæ, Pulvis Rosæ Compositus, and Unguentum Rosatum.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Fr., Ger., Hung., Ital., Jap., Port., Russ., Span., Swiss and U.S.

Descriptive Notes.—There are several varieties of *Rosa Gallica* in cultivation, the flowers of which are met with in commerce. The petals of those cultivated in England obtain a higher price than 'Exotic petals,' *i.e.*, those imported from France, Germany, Holland, etc., having a brighter red colour, a greater fragrance, and being less broken. The dried petals consist of the flower bud with the lower or calycine portion removed, and the buds are more or less broken up in drying; they have a purplish-rose tint, but are yellowish towards the base. The taste is feebly acid, astringent, and slightly bitter. The fragrance depends upon the variety under cultivation, that known as General Jacqueminot affording a fragrant product of good colour, but the colour depends partly also upon the maturity of the petal and the care taken in drying. Inferior specimens coloured with aniline dyes are sometimes offered, but these are readily detected by the absence of the yellow base of the petal, as the whole becomes reddened by the dye.

Tests.—Red-Rose Petals leave about 4 p.c. of ash when incinerated with free access of air.

Preparations.

CONFECTIO ROSÆ GALLICÆ. Confection of Roses.

Fresh Red-Rose Petals, 1; Refined Sugar, 3. (1 in 4)

Used as a pill basis. Also applied in aphthous conditions of the mouth.

Official in U.S.

INFUSUM ROSÆ ACIDUM. Acid Infusion of Roses.

Red-Rose Petals, dried and broken, ½ oz.; Diluted Sulphuric Acid, 2 fl. drm.; Distilled Water, boiling, 20 fl. oz.; infuse 15 minutes. (1 in 40)

A similar infusion was in use in 1674.

Prescribed with Alum it forms a good **gargle**, but Borax or Alkalis change the colour to green.

Dose.—½ to 1 fl. oz. = 7·1 to 14·2 c.c.

Foreign Pharmacopœias.—Official in Port. (Infuso de Rosas Composto), Red-Rose Petals, 5; Diluted Sulphuric Acid, 2; Boiling Water, 200.

SYRUPUS ROSÆ. Syrup of Roses.

Dissolve (with heat) 30 of Sugar in an infusion of dried Red-Rose Petals, 2; Refined Sugar, 30; boiling Distilled Water, 20; the total weight should be nearly 46. (1 in 17¼)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Belg., Fluid Extract 1, Simple Syrup 9; Mex., made from Rosa Centifolia; U.S., Fluid Extract 125, Dilute Sulphuric Acid 10, Sugar 750, Water, *q.s.* to make 1000.

Not Official.

FLUIDEXTRACTUM ROSÆ.—1000 grammes of Roses, in No. 20 powder, percolated with a mixture of 100 c.c. Glycerin, and 900 c.c. of Diluted Alcohol (Alcohol 50 p.c.) until the powder is exhausted. Reserve the first 750 c.c., and evaporate the remainder, at a temperature not exceeding 50° C. (122° F.), to a soft extract, dissolve this in the reserved portion, and make up with Diluted Alcohol to 1000 c.c.—*U.S.P.*

Official in Belg.

This has been incorporated in the *B.P.C.*, employing Alcohol (60 p.c.).

INFUSUM ROSÆ ACIDUM CONCENTRATUM.—Dried Red-Rose Petals, in No. 20 powder, 20; Diluted Sulphuric Acid and Alcohol (20 p.c.), of each sufficient to make 100. Moisten the powder with some of the Alcohol containing one-fortieth its volume of Diluted Sulphuric Acid, macerate for 2 hours, then pack in a glass percolator and percolate slowly with more of the Acidulated Alcohol until 92½ has been collected. Add to this 7½ of Diluted Sulphuric Acid, set aside for 7 days, filter. Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.—*Farr* and *Wright*, *P.J.* '06, i. 165, and '07, i. 622; *C.D.* '06, i. 252; *Y.B.P.* 1907, 251.

This appears in the *B.P.C.*

INFUSUM ROSÆ CUM ACIDO NITRICO.—Rose Petals, broken small, 2; Diluted Nitric Acid, ½; cold Distilled Water, 40; infuse 2 hours, frequently stirring, strain, and add Powdered Sugar, 1.

MEL ROSÆ.—Fluid Extract of Roses 12 c.c., Clarified Honey, a sufficiency to make the product weigh 100 grammes.—*U.S.P.*

This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in Ger. and Jap., 1 of Rose Leaves is macerated with 5 of Alcohol (90 p.c.) for 24 hours; express and filter; mix with the filtrate 9 of Purified Honey and 1 of Glycerin, and evaporate to 10; both by weight. Mel Rosatum is also official in Austr., Dutch, Fr., Mex. and Swiss, but the formulas differ a good deal from one another.

PULVIS ROSÆ COMPOSITUS.—Oil of Rose and Chloroform, of each 1 (or combined 4 drops); Acacia, 145 grains; Sugar, 840 grains; Solution of Carmine, 13 drops. Useful as an agreeable diluent for powders such as Calomel, Grey Powder, and Jalapin, also as a colouring and flavouring agent in mixtures, ¼ or ½ oz. in 6 oz.—*Martindale.*

This has been incorporated in the *B.P.C.* as follows:—Oil of Rose, 0·10; Gum Acacia, in powder, 15; Solution of Carmine, 1·25; Refined Sugar, in powder, *q.s.* to produce 100.—*B.P.C.*

UNGUENTUM ROSATUM.—Alkanet Root, crushed, 13 grains; Otto of Roses, 1 minim; White Wax, 4 grains; Prepared Lard, 1 oz.

Alkanna Root, bruised, 3; White Beeswax, 1; Oil of Rose, 0·20; Lard, *q.s.* to produce 100.—*B.P.C.*

ROSÆ OLEUM.

OIL OF ROSE.

B.P.Syn.—Otto of Rose.

Fr., Essence de Rose; Ger., Rosenöl; Ital., Essenza di Rose; Span., Esencia de Rosa.

At a temperature of about 30° C. (86° F.), it is a pale yellow, or greenish-yellow, oily liquid, of about the consistency of Almond Oil. It has a very powerful rosaceous odour and somewhat sharp taste. At temperatures between 18° to 21° C. (64·4° to 69·8° F.), shining, acicular crystals, or glistening crystalline laminæ, separate out, and when further cooled the Oil sets to a semi-solid crystalline mass, which again melts when gently warmed.

It is officially described as the Oil distilled from the fresh plant of *Rosa damascena*, Miller. The *U.S.P.* describes it as a volatile Oil distilled from the fresh flowers of *Rosa damascena*, Mueller, and requires it to possess, when assayed by the process described in small type below, a Saponification value of not less than 10 nor more than 17. The *P.G.* describes it as a volatile Oil from the corolla of some varieties of roses, without defining any species.

It should be kept in well-stoppered glass bottles of a dark amber tint in a cool place and protected as far as possible from the light.

The Oil should be completely liquefied by heat and well mixed before being used for dispensing purposes.

The average composition of Otto of Rose is stated to be Geraniol 40 p.c., Citronellol 28 p.c., Phenyl-ethyl Alcohol, 1 p.c., Stearoptene 18 to 19 p.c. and small quantities of Linalool, Citral, Normal Nonylic Aldehyde, and other bodies.

The vehicle of the odour is the elæoptene (Rhodinol) alone, and the less stearoptene there is in an otto used for manufacturing purposes the better.—*C.D.* '96, ii. 349.

Medicinal Properties.—The principal use in pharmacy is as a perfume in various preparations.

Official Preparation.—Contained in Unguentum Aquæ Rosæ.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Jap., Mex., Port., Russ., Swiss and U.S.

Tests.—Rose Oil is officially required to possess a sp. gr. of 0·856 to 0·860 at 30° C. (86° F.), the statement referring to the sp. gr. of the Oil at 30° C. (86° F.) as compared with Water at 15·5° C. (60° F.), *vide Digest of Researches and Criticisms Report for* 1898. The *U.S.P.* gives a sp. gr. of 0·855 to 0·865 at 25° C. (77° F.), the *P.G.* gives no figures for the sp. gr. The *Fr. Codex* (1908) gives 0·855 to 0·865 at 20° C. (68° F.). The *B.P.* limit of gravity is generally considered too high, it usually falls from 0·850 to 0·858. The Oil is lævogyrate; the optical rotation of good specimens being from − 1° 30′ to − 3°; neither the *U.S.P.* nor the *P.G.* includes a determination of the optical rotation. The congealing point lies between 19° and 22° C. (66·2° and 71·6° F.). The *B.P.* states that the congealing and melting points vary according to the proportion of crystalline matter, but should lie between 19·4° and 22·2° C. (67° and 72° F.), the *U.S.P.* gives the congealing point as between 18° and 22° C. (64·4° and 71·6° F.), and gives specific instructions as to the method to be adopted in determining the congealing point, which instructions appear below. The *P.G.* states that crystals commence to separate out at 18° to 21° C. (64·4° to 69·8° F.), melting again at a higher temperature. The *Fr. Codex* (1908) gives 23·5° C. (74·3° F.). The refractive index of the Oil lies between 1·459 and 1·464; neither the *B.P.*, *U.S.P.* nor *P.G.* refers to the refractive index. Useful information is afforded of the genuineness of an Oil by a determination of the Acid and Ester values, the Acid value varies from 0·5 to 3 and the Ester value from 8 to 16; the *B.P.* makes no reference either to the Acid or Ester value. The *U.S.P.* does not include an Ester value, but requires the Saponification value to be not less than 10 nor more than 17 as determined by the process given in small type below. The *P.G.* does not include either an Acid or an Ester value. The Oil contains from 18 to 23 p.c. of Stearoptene, and when the Stearoptene is carefully separated and purified it possesses a m.p. of from 33° to 35° C. (91·4° to 95° F.). The Iodine absorption has been suggested (*Analyst* '04, 175; *C.D.* '04, i. 398; '04, ii. 703) as a means of detecting adulterated samples. The Iodine absorption of genuine Otto was found to range from 187 to

194, that of artificial Oil from 221 to 254 for Oils containing Stearoptene, for those without Stearoptene, 261 to 279. Further information concerning the genuineness or otherwise of a specimen may be obtained by a determination of the percentage of Geraniol or Citronellol by acetylisation. The percentage of Geraniol generally present in genuine samples varies from 65 to 75 p.c., and occasionally may be as high as 76 p.c. Citronellol ranges from 25 to 35 p.c., Geraniol from 30 to 33 p.c.

The chief and most commonly occurring adulterant of Otto of Rose is Turkish Geranium Oil, the presence of which may be determined by the alteration which it causes in one or more of the above constants of the Oil. Geranium Oil lowers the sp. gr. and increases the Ester value, it also lowers the congealing point. In addition to Geranium Oil a specimen may contain Spermaceti, Paraffin Wax, Palma Rosa Oil and Guaiacum Wood Oil. Spermaceti and Paraffin Wax may be detected by a determination of the m.p. of the Stearoptene, and also the determination of its amount. Spermaceti, if present, may be recognised by a determination of the Saponification value of the separated Stearoptene, Spermaceti absorbing an appreciable amount of Potassium Hydroxide on saponification. Palma Rosa Oil, if present, may be detected by its influence on the Saponification value, and also by its effect on the Alcohol-content as determined by acetylisation. Guaiacum Wood Oil may be detected by the microscopical appearance of the crystals separating from the Oil on cooling, and by the isolation and a determination of the m.p. of the Alcohol, Guaiol; the pure Alcohol melts at 91° C. (195·8° F.). Guaiacum Wood Oil tends to increase the sp. gr. and the optical rotation of the Oil, to raise the congealing point and to slightly lower the Saponification value. Guaiacum Wood Oil leaves on evaporation a resinous mass amounting to about 16·2 p.c. Its presence is also indicated by the m.p. and by a determination of the Acetyl value of the Stearoptene.

The Oil of White Rose is stated to contain a large percentage of Stearoptene, and has therefore been used to rectify the decrease in Stearoptene-content caused by the addition of other adulterants. Parry does not see that a White Rose product should be regarded as an adulteration because it yields a few per cent. more Stearoptene. The *B.P.* monograph requires complete revision.

Determination of Melting Point.—Introduce about 10 c.c. of Oil into a test-tube of about 15 mm. diameter; insert a thermometer in such a manner that it touches neither the bottom nor the sides of the tube. Raise the temperature of the Oil in the tube from 4° to 5° above the saturation point by grasping it in the hand, and shake the tube gently. Allow the Oil to cool, and, when the first crystals appear, note the temperature. This is regarded as the congealing point; a second test should be made for confirmation, *U.S.P.*

Volumetric Determination.—A measured quantity of 2 c.c. of the Oil is accurately weighed out in a weighing bottle and transferred by means of a little Alcohol (94·9 p.c.) to a flask having a capacity of about 100 c.c.; 20 c.c. of Semi-Normal Volumetric Alcoholic Potassium Hydroxide Solution added, and after connecting with a reflux condenser, the mixture boiled during half an hour on a water bath; the mixture is then cooled, diluted with 50 c.c. of Distilled Water, a few drops of Phenolphthalein T.S. added, and the excess of Volumetric

Alkali Solution titrated with Semi-Normal Volumetric Sulphuric Acid Solution. The number of c.c. of Semi-normal Volumetric Sulphuric Acid Solution is subtracted from 20, the difference is multiplied by 27·87, and the product divided by the weight of Oil taken, the result being the Saponification value of the Oil.—*U.S.P.*

ROSÆ AQUA.

ROSE WATER.

FR., EAU DISTILLÉE DE ROSE; GER., ROSENWASSER; ITAL., ACQUA DISTILLATA DI ROSE; SPAN., AGUA DESTILADA DE ROSAS.

A clear, colourless liquid, possessing a strong rosaceous odour, prepared by distillation from the flowers of *Rosa damascena*, Miller, and diluted, immediately before use, 1 to 2 of Distilled Water.

The Rose Water of commerce is a saturated solution of the essential Oil of the Rose flowers.

Medicinal Properties.—An agreeable vehicle for medicines; employed in making lotions and eye-washes.

Official Preparation.—Unguentum Aquæ Rosæ. Contained in Mistura Ferri Composita, and the 'Rose Basis' for Lozenges.

Foreign Pharmacopœias.—Official in Austr., Oil 5 drops, Warm Water 1000 grammes; Belg., Oil 0·3, Warm Water 1000; Dan., Oil 1, Tepid Distilled Water 10,000; Dutch, Oil 1, Water 5000; Fr., Mex., Port. and Span., 1 of petals in 1; Ger. and Jap., Oil 4 drops, Tepid Distilled Water 1000 c.c.; Ital., 1 in 2; Swiss, the Rose Water of commerce, undiluted; U.S. (Aqua Rosæ Fortior), the Rose Water of commerce (Aquæ Rosæ), diluted with equal parts of Water.

Preparation.

UNGUENTUM AQUÆ ROSÆ. ROSE WATER OINTMENT. *N.O.Syn.*—COLD CREAM.

Heat until dissolved, Beeswax 1½ oz., Spermaceti 1½ oz., and Almond Oil (by weight) 9 oz.; transfer to a warmed mortar, and add gradually with trituration Rose Water (undiluted) 7 fl. oz.; finally mix in 8 minims of Oil of Rose, and continue stirring until cold.

A similar formula occurs in several of the Foreign Pharmacopœias, *see* p. 357.

Foreign Pharmacopœias.—Official in Mex., Rose Petals 1, Hog's Fat 1; Span., Rose Petals digested with an equal weight of Hog's Fat at a gentle heat for 3 days; U.S., Spermaceti 125, White Wax 120, Expressed Oil of Almond 560, Sodium Borate 5, Stronger Rose Water 190; Fr., (Cérat de Galien), White Wax 10, Almond Oil 40, Rose Water 25, all by weight; also Cérat à la Rose, White Wax 100 grammes, Vaseline 100 grammes, Carmine 1 gramme, Vaseline Oil 4 grammes, Otto of Rose 20 drops.

ROSMARINI OLEUM.

OIL OF ROSEMARY.

N.O.Syn.—OLEUM ANTHOS.

FR., ESSENCE DE ROMARIN; GER., ROSMARINÖL; ITAL., ESSENZA DI ROSMARINO; SPAN., ESENCIA DE ROMERO.

A colourless, pale yellow, oily, limpid liquid, possessing a characteristic camphoraceous odour, and an aromatic and cooling taste. It is distilled from the Flowering Tops of *Rosmarinus officinalis*, L.

Neither the *B.P.* nor the *P.G.* requires the Oil to contain any definite amount of Ester or of total Borneol. The *U.S.P.* requires it to contain not less than 2·5 p.c. of Ester calculated as Bornyl Acetate and not less than 10 p.c. of total Borneol.

It should be kept in well-stoppered glass bottles of a dark amber tint in a cool place and protected as far as possible from the light.

Rosemary Oil contains from 5 to 6 p.c. of Esters, chiefly Bornyl Acetate, and from 15 to 20 p.c. of Borneol. It also contains a mixture of dextro- and lævo-Pinene, Camphene, Cineol and Camphor The *B.P.C.* states that the chief constituents are about 6 p.c. of Borneol and from 17 to 20 p.c. of Bornyl Acetate and other esters.

That distilled in Britain is superior to the imported.

Solubility.—In all proportions of Absolute Alcohol; 2 in 1 of Alcohol (90 p.c.); sparingly in Alcohol (60 p.c.).

Medicinal Properties.—Aromatic and carminative. It is used in hair lotions and liniments as a stimulant; also used for its odour, which is disliked by insects.

Dose.—$\frac{1}{2}$ to 3 minims = 0·03 to 0·18 c.c.

Official Preparations.—Spiritus Rosmarini. Contained in Linimentum Saponis and Tinctura Lavandulæ Composita.

Foreign Pharmacopœias.—Official in Austr., Dutch, Ger., Hung., Jap., Russ., Swiss and U.S. (Oleum Rosmarini); Belg. (Rorismarini Essentia); Dan., Norw. and Swed. (Aether-oleum Rosmarini); Fr. (Essence de Romarin); Ital. (Essenza di Rosmarino); Port. (Essencia de Alecrim); Span. (Esencia de Romero). Not in Mex.

Tests.—Rosemary Oil has a sp. gr. of 0·900 to 0·920. The *B.P.* states 0·900 to 0·915, but the latter figure is regarded as too stringent. The *U.S.P.* states 0·894 to 0·912 at 25° C. (77° F.); the *P.G.* not under 0·900. It is dextrogyrate, the optical rotation being from + 1° to + 18°. The *B.P.* gives the optical rotation as not more than + 10° in a tube 100 mm. long. The *U.S.P.* states that the angle of rotation shall not be more than + 15° in a 100 mm. tube at a temperature of 25° C. (77° F.); *P.G.* does not give a figure for the optical rotation of the Oil. It is soluble in all proportions of Absolute Alcohol, and should dissolve in twice its volume of Alcohol (90 p.c.). The *U.S.P.* states that it is soluble in about one-half volume or more of Alcohol (90 p.c.), also in 2 to 10 volumes of Alcohol (80 p.c.). The *P.G.* that the Oil should afford a clear solution in half its weight of Alcohol (90 p.c.). Neither the *B.P.* nor the *P.G.* gives a method for determining the proportion of Ester in terms of Bornyl Acetate nor the total Borneol present; the former may be determined by saponification, the latter by acetylisation. The *U.S.P.* employs the saponification and acetylisation process described in small type below.

The more generally occurring impurities are Turpentine Oil, Petroleum Oil and Alcohol. Turpentine, if present in considerable quantity, may be detected by the optical rotation of the sample and if present in small proportion by the optical rotation of the first 10 p.c. of the distillate. It also causes a diminution in the sp. gr.

French Turpentine Oil is indicated by the Oil assuming a lævo-rotation, or by the lævo-rotation of the first 10 p.c. yielded on distillation. The *U.S.P.* requires the first 10 p.c. fraction to be dextrogyrate. Petroleum Oil is detected by the diminished solubility of the Oil in Alcohol (90 p.c.), and by the residue left on evaporating the Oil on a water-bath. Pure Rosemary Oil leaves only a slight amount of residue of a resinous character. The presence of Alcohol may be detected by the addition of a little solid Magenta. Magenta imparts no colour to the pure Oil, but the dye dissolves in the presence of Alcohol. Fractions of Camphor Oil have also been met with as adulterants of Oil of Rosemary, but their presence may be detected by the influence on the rotatory power or their sp. gr., or their effect on the solubility of the Oil in Alcohol (90 p.c.).

Notwithstanding the official requirements, as well as those of other Pharmacopœias, that the Oil should be dextrogyrate, undoubtedly genuine samples are found which are lævogyrate.

According to Parry (*C.D.* '06, i. 671) the lævorotatory constituent occurs in greater proportion when the stalks are included, and an inferior Oil is then obtained. Oils derived from carefully picked leaves yield fractions which are lævogyrate, the genuine lævorotatory Oil, containing a comparatively low percentage of Borneol, may be assumed to have been distilled from both leaves and stalks. A dextrorotatory Oil may, moreover, yield lævorotatory fractions, a first fraction of 10 p.c. having a lævogyrate optical rotation. The Spanish Pharmacopœia states that the Oil is lævogyrate. Schimmel is of opinion that in any case it will be well to continue exercising care in dealing with lævorotatory Rosemary Oils. He reports an authenticated sample of English Oil, examined in their laboratory, which possessed a sp. gr. of 0·9042, an optical rotation of −2° 49′, an Ester value of 9·7, and which was soluble 1 in about 5 of Alcohol, (80 p.c.), with very slight turbidity; the optical rotation of the first 10 p.c. distillate was − 6° 10′. Samples of English Oils distilled during the years 1905, 1906, 1907 were indisputably genuine in character, and possessed optical rotations of −0° 24′ to −2° 48′.

Specimens of the various imported varieties examined in the author's laboratory in June 1893 showed optical rotations as follows:—

Eperte . . .	price 3*s*. 1*d*.	per lb.,	rotation	− 8°	soluble in S.V.R.	2 in 1
Extra . . .	,, 2*s*. 6*d*.	,, ,,	,,	− 12°	,, ,, ,,	2 in 1
Super . . .	,, 1*s*. 9*d*.	,, ,,	,,	− 33°	,, ,, ,,	2 in 9
Fine . . .	,, 1*s*. 3*d*.	,, ,,	,,	− 40°	,, ,, ,,	2 in 10
French Turpentine .			,,	− 57°	,, ,, ,,	2 in 8

Specimens examined in the author's laboratory within recent years all possessed a dextro-rotation varying from + 7° to + 11°.

Volumetric Determination of Esters.—A measured quantity of 10 c.c. of the Oil is introduced into a tared flask, and its weight accurately determined. A measured quantity of 25 c.c. of Semi-normal Volumetric Alcoholic Potassium Hydroxide Solution is added, the flask connected with a reflux condenser, and the mixture boiled for 1 hour. It is then allowed to cool, and the excess of Semi-normal Volumetric Alcoholic Alkali Solution is titrated with Semi-normal Volumetric Sulphuric Acid, using Phenolphthalein T.S. as an indicator of neutrality. The number of c.c. of Semi-normal Volumetric Sulphuric Acid Solution required is subtracted from 25, the difference multiplied by 9·734, and the product divided by the weight of Oil taken, the quotient representing the percentage of esters present in the Oil, expressed in terms of Bornyl Acetate. The residual Oil from the saponification, is washed repeatedly with Water, transferred to an acetylisation flask, mixed with 10 c.c. of Acetic Acid Anhydride and about 1 gramme of anhydrous Sodium Acetate, and boiled gently for 1 hour. The mixture is allowed to cool, the acetylised Oil is washed with Distilled Water and subsequently with Sodium Hydroxide T.S. until it is slightly alkaline to Phenolphthalein T.S., and is then dried by means of fused Calcium Chloride and filtered, *U.S.P.*

Volumetric Determination of total Borneol.—A measured quantity of 5 c.c. of the dry acetylised Oil prepared as above is transferred to a tared flask, of about a capacity of 100 c.c., and the weight accurately determined. 50 c.c. of Semi-normal Volumetric Alcoholic Potassium Hydroxide Solution is added, the flask connected with a reflux condenser, the mixture boiled for 1 hour; when cooled the excess of Semi-normal Volumetric Alcoholic Alkali Solution is titrated with Semi-normal Volumetric Sulphuric Acid Solution, using Phenolphthalein Solution as an indicator of neutrality. The number of c.c. of Semi-normal Volumetric Sulphuric Acid Solution required is subtracted from the number of c.c. of Semi-normal Volumetric Alcoholic Potassium Hydroxide used (50 c.c.). The difference is multiplied by 7·649, and the product divided by the weight of dry acetylised oil employed, less the product of the multiplication of the number of c.c. of Semi-normal Volumetric Alcoholic Potassium Hydroxide Solution absorbed by the acetylised oil by 0·021, the quotient represents the total percentage of Borneol present in the specimen under examination, *U.S.P.*

Preparation.

SPIRITUS ROSMARINI. Spirit of Rosemary.

Oil of Rosemary, 1; Alcohol (90 p.c.), *q.s.* to yield 10. (1 in 10)

In *B.P.* '85 it was 1 in 50.

Dose.—5 to 30 minims = 0·3 to 1·8 c.c.

Foreign Pharmacopœias.—Official in Austr., from leaves; Jap., 1 in 9; Port. (Espirito d'Alecrim), Rosemary 5, Water 2, Alcohol (85 p.c.) 10; Mex. (Alcoholato de Romero compuesto), Dried leaves 1, Lavender 1, Alcohol (80 p.c.) 10, Water 2; Russ., 1 in 100; Span. (Alcohol de Romero), Rosemary 1, Alcohol (60 p.c.) 2; Swiss (Spiritus Rosmarini Compositus), Lavender 1, Peppermint 1, Rosemary 1, Salvia 1, Wormwood 1, Alcohol 20, Water 50.

Unguentum Rosmarini Compositum official in Ger., Lard 16, Mutton Fat 8, Yellow Wax 2, Expressed Oil of Nutmeg 2, Oil of Rosemary 1, Juniper Oil 1; Swiss, Oil of Rosemary 1, Oil of Turpentine 3, Juniper Oil 6, Oil of Laurel 10, Yellow Wax 24, Lard 56.

Not Official.

RUTÆ OLEUM.

OIL OF RUE.

Fr., Essence de Rue; Ger., Rautenöl; Ital., Essenza di Ruta; Span., Aceite de Ruda.

A colourless, or pale yellow, oily liquid, possessing an intense, persistent, characteristic odour. It is distilled from the fresh Herb of *Ruta graveolens*, L.

Medicinal Properties.—Antispasmodic. A topical stimulant and rubefacient. Administered in the form of enema for flatulent colic in children.

Dose.—1 to 4 minims = 0·06 to 0·24 c.c.

Foreign Pharmacopœias.—Official in Belg., Port. and Span.

French Oil of Rue is stated by Schimmel to differ from the Algerian Oil in its congealing point, both contain about 90 p.c. of ketones, but the French Oil contains almost exclusively Methyl-nonyl-ketone, m.p. 15° C. (59° F.), the Algerian, Methyl-heptyl-ketone m.p. −16° C. (3·2° F.).

Power and Lees in the examination of an essential Oil of Rue, apparently of Algerian origin, found the following constituents:—Methyl-*n*-heptyl ketone, Methyl-*n*-nonyl ketone, Methyl-*n*-heptylcarbinol, Methyl-*n*-nonylcarbinol, a blue Oil of high and inconstant boiling point, Acetic Acid in combination with Alcohols, a basic substance having an odour of Quinoline, a mixture of free fatty acids, Methyl Salicylate, an ester of Valeric Acid, apparently Ethyl Valerianate, Pinene, Lævolimonene and Cineol. The two ketones represented about 80 p.c. of the Oil, and were present in about equal amounts. The two alcohols represented about 10 p.c., and were present partly in the uncombined state and partly as Acetic esters, the Methyl-*n*-heptylcarbinol preponderating. The two Terpenes, together with Cineol, represented about 1 p.c. of the Oil. There was very little Pinene, and the amounts of Limonene and Cineol were about equal. The amount of blue Oil was about ½ p.c., and finally there was separated from the non-ketonic portion of the Oil a small amount of undistillable viscous substance, which was probably a decomposition product.—*Report of the Wellcome Chemical Research Laboratories.*

Tests.—Oil of Rue has a sp. gr. of 0·833 to 0·840, it is dextrogyrate possessing an optical rotation in a 100 mm. tube of +2°, the solidifying point is 8° to 10° C. (46·4° to 50° F.). It dissolves to form a clear solution in an equal volume of Alcohol (90 p.c.) or in 2 to 3 parts of Alcohol (70 p.c.). It was official in the *B.P.* '85.

CONFECTIO RUTÆ.—Fresh Rue, bruised, 1½ oz.; Caraway Seeds, 1½ oz.; Bay Berries, 1½ oz.; Prepared Sagapenum, ½ oz.; Black Pepper, 2 drm.; Honey, 16 oz.; Distilled Water, as much as may be necessary.—*P.L.* 1851.

This has been incorporated in the *B.P.C.*

ENEMA RUTÆ.—Confection of Rue, 3 drm.; Infusion of Chamomile, to make 20 fl. oz.—*St. George's.*

Confection of Rue, 1; Decoction of Barley, *q.s.* to produce 100.—*B.P.C.*

Oil of Rue, 20 minims; Starch Enema, 6 oz.—*Westminster.*

Not Official.

SABINÆ CACUMINA.

SAVIN TOPS.

FR., SABINE; GER., SADEBAUMSPITZEN; ITAL., SABINA; SPAN., SABINA.

The fresh and dried Tops of *Juniperus Sabina*, collected in spring from plants cultivated in Britain. The Savin Tops imported from France are not always those of *J. Sabina*.

It was official in *B.P.* '85.

Medicinal Properties.—A powerful local and general irritant. The ointment is used for maintaining discharges from granulating or blistered surfaces. It is a powerful emmenagogue, but its use requires caution, as it may cause inflammation of the abdominal and pelvic viscera.

Dose.—4 to 10 grains = 0·26 to 0·65 gramme.

Antidotes.—Stomach-tube, emetics; Castor Oil, Linseed poultices to the abdomen, opiates and demulcents.

Foreign Pharmacopœias.—Official in all except Ger., Jap., Span. and Swed.

Descriptive Notes.—Savin Tops are usually supplied in this country in the fresh state from the cultivated shrub, of which there exist two or three varieties; less frequently in the dried state, in the form of woody twigs or branchlets, 6 to 9 inches (15 to 22·5 cm.) long or more; or imported from Italy and the south of France in the form of broken twigs freed from the woody portion. In the Savin cultivated in England the leaves are generally spreading, but in the exotic Savin they are closely imbricated so as to form nearly cylindrical branchlets. The leaves are narrowly triangular and concavo-convex, about $\frac{1}{8}$ to $\frac{1}{6}$ inch (3 to 4 mm.) long and $\frac{1}{16}$ inch (1·5 mm.) in diameter, an oval oil gland being situated in the middle of the convex back of the leaf. It has a characteristic taste, and a distinctive odour when bruised, by which it can be recognised from other nearly allied species of Juniperus. French Savin is sometimes derived from *Juniperus phœnicea*, L., and *Juniperus thurifera*, L., var. *Gallica.—Coincy, P.J.* (4) xxi. 829-831.

Preparations.

TINCTURA SABINÆ.—1 of Savin Tops, dried and coarsely powdered, percolated with Alcohol (60 p.c.), to yield 8.

Dose.—20 to 60 minims = 1·2 to 3·6 c.c.

B.P. 1885, omitted in *B.P.* 1898, and now incorporated in the *B.P.C.*

U.S. has Fluidextractum Sabinæ, 1 in 1, with Alcohol (95 p.c.).

UNGUENTUM SABINÆ.—Fresh Savin Tops, bruised, 8; Yellow Beeswax, 3; Benzoated Lard, 16; melt the Lard and the Beeswax together on a water-bath, add the Savin, digest 20 minutes, strain, and press through calico.

B.P. 1885, omitted in *B.P.* 1898, and now incorporated in the *B.P.C.*

OLEUM SABINÆ.—A colourless, or pale yellow, oily liquid, possessing a peculiar, unpleasant, narcotic odour, and bitter, pungent, camphoraceous taste. It should be preserved in dark, amber-tinted, well-closed bottles. It is liable to become darker in colour and to thicken on exposure to air. It is a volatile Oil distilled in Britain from fresh Savin.

The principal constituent of the Oil is an Alcohol Sabinol, which appears in the Oil chiefly in the form of Sabinol Acetate, corresponding to a content of about 40 to 44 p.c. It also contains Cadinene, Pinene and Camphene, and an aldehyde or ketone possessing when re-formed from its Sodium Acid Sulphite compound an odour faintly resembling Cuminic Aldehyde.

Solubility.—4 in 1 of Alcohol (90 p.c.), in all proportions of Absolute Alcohol.

Dose.—1 to 4 minims = 0·06 to 0·24 c.c.; in **pill** with Soap and Liquorice Powder, *see* p. 897.

Foreign Pharmacopœias.—Official in Belg., Jap., Port. and U.S.

Tests.—Savin Oil has a sp. gr. of 0·910 to 0·930. An optical rotation of +40° to +60°, a Saponification value of 115 to 125. It dissolves to form a clear solution in about half its volume or more of Alcohol (90 p.c.), but does not form a perfectly clear solution in from 15 to 20 volumes of Alcohol (80 p.c.).

SACCHARINUM. *See* GLUSIDUM.

SACCHARUM LACTIS.

MILK SUGAR.

B.P.Syn.—Lactose.

$C_{12}H_{22}O_{11}, H_2O$, eq. 357·48.

Fr., Lactose; Ger., Milchzucker; Ital., Lattosio; Span., Lactosa.

White, or almost white, prismatic crystals, or masses of crystals, or as a white, odourless powder, possessing a slightly sweet taste. It is obtained by recrystallisation from the evaporated Whey of cow's Milk.

Solubility.—1 in 6 of cold Water; 1 in 1 of boiling Water; almost insoluble in Alcohol (90 p.c.).

Medicinal Properties.—Nutrient in various cases of extreme irritability of the stomach, as it does not ferment so readily as Cane Sugar; it is used to mix with the food of children. Added to diluted cow's Milk a good substitute for human Milk is formed. Slightly diuretic in cardiac dropsy. Useful for triturating with potent medicinal powders, in order to equally distribute the dose.

Dose.—60 to 120 grains = 4 to 8 grammes, or more in Water.

Official Preparations.—Used in the preparation of Extractum Belladonnæ Alcoholicum, Extractum Nucis Vomicæ, Extractum Physostigmatis, Extractum Strophanthi and Pulvis Elaterini Compositus.

Foreign Pharmacopœias.—Official in all. Fr. (Lactose), Ital. (Lattosio), Mex. (Azucar de Leche), Port. (Assucar de Leite), Span. (Lactosa).

Tests.—Milk Sugar dissolves in Water forming a clear solution, which is neutral in reaction towards Litmus paper and which is dextrogyrate. A small quantity of the aqueous solution added to Potassio-cupric Tartrate (Fehling's) Solution, produces an immediate red precipitate of Cuprous Oxide, when boiled with an equal volume of Sodium Hydroxide Solution the liquid turns yellowish-brown and finally a brownish-red. Milk Sugar may be readily determined by titration with Pavy's Copper Solution. When present together with Cane Sugar the latter may be also determined by inverting with Citric Acid and making a separate determination of the reducing power of the inverted solution by Pavy's Solution. The difference between the reducing power of the solution before and after inversion corresponds to the amount of Cane Sugar present. 49·4 parts of Cane Sugar have the same reducing power as 100 parts of Milk Sugar. Citric Acid does not invert Milk Sugar but readily inverts Cane Sugar. Milk Sugar when boiled with Sulphuric Acid undergoes hydrolysis, with the formation of Dextrose and Galactose.

The more generally occurring impurities are heavy metals, *e.g.*, Arsenic, Copper, Lead, Iron and Zinc, Cane Sugar, Dextrin, Starch, free Lactic Acid, and mineral matter. Arsenic, Copper, Lead, Iron and Zinc, if present, may be detected by the Hydrogen Sulphide test, either in a solution rendered faintly acid with diluted Hydrochloric Acid or in one made alkaline with Ammonia Solution. Cane Sugar and Dextrin, if present, may be detected by the Alcohol test and Starch by the Iodine test. If free Lactic Acid be present, the quantity may be determined by titrating a weighed quantity of the substance with Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. The *B.P.* requires that a solution of 1 gramme in 10 c.c. of Water should produce a red coloration under these conditions with 3 drops of the volumetric alkali solution. Assuming that the 3 drops are required, this would be equivalent to 1·3 p.c. of Lactic Acid. The majority of average commercial samples require considerably less. The Alcohol and Iodine tests are described below. Mineral matter, if present, may be detected by the residue left on ignition. The *B.P.* and the *U.S.P.* both require that it shall not leave more than ¼ p.c. of ash after ignition; the *P.G.* that 0·2 of a gramme of the specimen shall not leave a weighable residue.

Alcohol.—If a mixture of 15 grammes of Milk Sugar and 50 c.c. of diluted Alcohol be allowed to stand for half an hour with occasional agitation and then filtered, a filtrate is obtained 10 c.c. of which mixed with an equal volume of Absolute Alcohol should not become turbid and on evaporation on a water-bath should not leave more than 0·04 gramme of residue, *P.G.*; 1 gramme digested for half an hour, with intervals of occasional shaking, with 10 c.c. of Alcohol (48·9 p.c.), filtered, and the filtrate mixed with an equal volume of Absolute Alcohol should afford a clear mixture, which, when evaporated on a water-bath, should yield not more than 0·03 of a gramme of residue, indicating the absence of Cane Sugar, *U.S.P.*

Iodine.—If 1 gramme of Milk Sugar be boiled with 50 c.c. of Distilled Water for 5 minutes and the solution cooled, no blue coloration should be produced upon the addition of 1 drop of T.S. of Iodine, *U.S.P.*

SACCHARUM PURIFICATUM.

REFINED SUGAR.

B.P.Syn.—SUCROSE.

$C_{12}H_{22}O_{11}$, eq. 339·60.

FR., SUCRE BLANC OFFICINAL; GER., ZUCKER; ITAL., ZUCCHERO; SPAN., AZUCAR.

Colourless, translucent, prismatic crystals, or a fine, white, crystalline powder, possessing a sweet characteristic taste. Permanent in the air. Obtained from the Juice of the Sugar-cane.

Solubility.—100 in 45 of Water, measures 113; 1 in 100 of Alcohol (20 p.c.).

Medicinal Properties.—Nutrient, demulcent, used in catarrhal affections in the form of Candy, Syrup, etc.; also in irritant corrosive poisoning. Employed almost entirely as a sweetening agent and as a preservative, and to assist the suspension of powders. It assists the solution of Lime in Water.

It is taken as a respiratory fuel by men about to undertake excessive physical exertion.

Official Preparation.—Syrupus. Sugar in some form is contained in all Syrups and Lozenges, several Confections, Mixtures, Pills and Powders.

Foreign Pharmacopœias.—Official in all except Norw. Fr. (Sucre Blanc Officinal), Ital. (Zucchero), Mex. (Azucar de Cana), Port. (Assucar), Span. (Azucar).

Tests.—Refined Sugar dissolves readily in Water, forming a clear solution which is neutral to Litmus paper; the *U.S.P.* states that the aqueous or alcoholic solution is neutral to Litmus paper, and the *P.G.* that aqueous and alcoholic solutions are neutral to Litmus paper. The *U.S.P.* states that an aqueous solution saturated at 25° C. (77° F.) should possess a sp. gr. of 1·340. A crystal of Sugar, when moistened with strong Sulphuric Acid, immediately chars and swells up, forming a black mass. When a few crystals are mixed with a little powdered Potassium Chlorate and touched with a drop of concentrated Sulphuric Acid, the mixture instantly ignites.

The more generally occurring impurities are insoluble salts, ultramarine, and Prussian blue. Glucose or Inverted Sugar, Calcium, Chlorides, Sulphates, and mineral matter. Insoluble salts, ultramarine, and Prussian blue, may be detected by the Water and Alcohol test described below. Heavy metals, such as Copper, Iron, Lead, and Zinc, may be detected by the addition of Hydrogen Sulphide to either a faintly acid solution or a solution rendered alkaline by Ammonia. The official directions for the detection of Glucose or Inverted Sugar are to heat the Syrup to a temperature of about 82·2° C. (180° F.) with Potassio-cupric Tartrate (Fehling's) Solution, or with Copper Sulphate Solution and an excess of Potassium Hydroxide Solution, when not more than a trace of red or yellowish precipitate should be produced; the *U.S.P.* employs the Silver Nitrate and Ammonia test described in the small type below. The Ammonium Oxalate, Silver Nitrate, and Barium Nitrate tests described below serve to detect Calcium, Chlorides, and Sulphates if present. It should leave scarcely any ash when ignited with free access of air. The *U.S.P.* makes no reference to the amount of ash, the *P.G.* states 0·5 of a gramme, when ignited, should leave no weighable residue.

Water and Alcohol.—One part by weight of Sugar should form, with 0·5 parts by weight of Water, a colourless, odourless syrup, possessing a purely saccharine taste and which mixes in all proportions with Alcohol (90 p.c.), *P.G.*

Both the aqueous and alcoholic solutions should be clear and transparent. When kept in large, well-closed and completely filled bottles, the solutions should not deposit a sediment on prolonged standing (absence of insoluble salts, ultramarine, Prussian blue, etc.), *U.S.P.*

Hydrogen Sulphide.—An aqueous solution (1-20) should not become turbid with T.S. of Hydrogen Sulphide, *P.G.*

Ammonium Oxalate.—An aqueous solution (1-20) should not become turbid more than opalescent with T.S. of Ammonium Oxalate, *P.G.*

Silver Nitrate.—An aqueous solution (1-20) should not become more than opalescent with T.S. of Silver Nitrate, *P.G.*

Silver Nitrate and Ammonia.—If 1 gramme of Sugar be dissolved in 10 c.c. of boiling Water, the solution mixed with 4 or 5 drops of Silver Nitrate T.S., then about 2 c.c. of Ammonia Water added, and the liquid quickly brought to the boiling point, not more than a slight coloration and no black precipitate should appear in the liquid after standing at rest for 5 minutes, *U.S.P.*

Barium Nitrate.—An aqueous solution (1-20) should not become more than opalescent with T.S. of Barium Nitrate, *P.G.*

Preparation.

SYRUPUS. Syrup.

Dissolve 10 of Sugar in 5 of boiling Distilled Water, and finally make up the total weight to 15.

9 measures of Syrup contain 8 of Sugar.

Foreign Pharmacopœias.—Official in all.

Tests. Syrup has a sp. gr. of 1·330. It should be strongly dextrogyrate. A small quantity, when placed in a test-tube with some Potassio-cupric Tartrate (Fehling's) Solution, and heated in a water-bath, should yield no decided red precipitate. The Syrup should be neutral in reaction towards Litmus paper.

Not Official.

SALEP.

The prepared tubers of *Orchis Morio*, L., and other species of *Orchis*.

Medicinal Properties.—Mucilaginous and nutrient.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Swed. and Swiss.

MUCILAGO SALEP.—Powdered Salep 1; agitate well with cold Water 10; pour on this boiling Water 90, and stir till cold.

Foreign Pharmacopœias.—Official in Dutch, Ger., Jap., Norw., Russ., Swed. and Swiss, 1 in 100.

Salib Misri, the Salep of the Indian Bazaars, is derived from a species of *Eulophia*.

SALICINUM.

SALICIN.

$C_{13}H_{18}O_7$, eq. 283·99.

FR., SALICINE; GER., SALICIN; ITAL., SALICINA.

Colourless, tabular crystals, or slender, white, shining, acicular crystals, possessing a very bitter taste. It is a glucoside occurring naturally in the Bark and Leaves of various species of *Salix* and of *Populus*.

It should be kept in well-stoppered vehicles of a dark amber tint.

Jowett (*Report of the Wellcome Chemical Research Laboratories*; *J.C.S. Trans.* '00, 707; *Y.B.P.* '00, 117) states that it has been generally assumed that the different species of Willow Bark contain the same glucoside (Salicin), but having had occasion to examine a bark purchased as Black Willow he found that the crystalline principle obtained by the usual method for preparing Salicin was not that substance, but a new glucoside for which the name of Salinigrin was proposed. During the determination of the constitution of the new glucoside he established the interesting fact that, whilst Salicin is the glucoside of *o*-Hydroxybenzyl Alcohol, Salinigrin is the glucoside of *m*-Hydroxybenzaldehyde. Salinigrin can easily be distinguished from Salicin by affording a colourless solution with Sulphuric Acid, whilst Salicin, under similar conditions, produces a blood-red colour. The investigations by Jowett into the variations in the occurrence of Salicin and Salinigrin (*C.D.* '02, ii. 347; *Y.B.P.* '02, 490) in Willow and Poplar Barks, wherein a considerable number of authentic specimens of *Salix* and *Populus* from the chief European and American species were examined, showed that, of the 33 samples examined, Salinigrin was only found in 1, *Salix discolor*, Muhl.; that the amount of Salicin contained in the bark of the Willow or Poplar depends not only on the species, but on the season of the year at which it is collected, the sex of the tree, and possibly other factors; that the results of the investigation have shown that for practical purposes chemical assay alone can decide whether a Willow bark does or does not contain Salicin.

Solubility.—1 in 28 of Water; 1 in 82 of Alcohol (90 p.c.); insoluble in Ether.

Medicinal Properties.—Antipyretic, antiperiodic, tonic, and bitter stomachic; has been specially recommended in acute rheumatism. For the latter purpose it has been largely replaced by Sodium Salicylate, the action of which is more powerful, though not so well sustained, as Salicin; but the Salicylate has a greater tendency to cause cardiac depression, and is not so well tolerated by the stomach as Salicin. Has been recommended for the prevention and cure of influenza.

20-grain doses 3 times a day given with great success in a case of lupus erythematosus.—*L.* '02, ii. 157.

15-grain doses in psoriasis: the patches became paler, the scales more detachable and soon ceased to reform, while patch cleared in the centre, and finally the circle broke up.—*B.M.J.* '03, i. 656; *L.* '95, i. 1421; '03, i. 784.

15 grains every 4 hours relieved the irritation and arrested maturation of the vesicles in smallpox.—*B.M.J.* '00, i. 16, 512, 1337; '00, ii. 127; '02, ii. 179; *P.J.* '02, ii. 113.

Dose.—5 to 20 grains = 0·31 to 1·3 grammes.

Prescribing Notes.—*It is given in* **cachets.** *A good pill can be made by adding 'Diluted Glucose,' q.s.*

Effervescent Granules can be obtained containing 5 grains in each drm.

Not Official.—Saligenin, Salinigrin and Salix Nigra.

Foreign Pharmacopœias.—Official in Ital., Mex., Port. and U.S.

Tests.—Salicin melts, when pure, at 200° C. (392° F.). The *U.S.P.* gives the m.p. as 201·4° C. (394·5° F.), when still more strongly heated [240° C. (464° F.)] it decomposes. When moistened with Sulphuric Acid it is coloured red. When heated with a small quantity of Potassium Bichromate and a little Sulphuric Acid it evolves an odour of Salicylic Aldehyde, recalling the odour of Meadow-Sweet. When warmed in a test-tube until it turns brown the residue, when mixed with Water, yields, on the addition of Ferric Chloride T.S., a violet coloration. When evaporated to dryness with a few drops of Nitric Acid, and the yellow residue is treated with Ammonia Water, it yields, when heated on a water-bath with a small quantity of Potassium Cyanide, a blood-red coloration. It dissolves in Water, forming a solution which is colourless and neutral in reaction towards Litmus, and which is strongly lævogyrate. The *U.S.P.* states that, when moistened with Sulphuric Acid containing a trace of Molybdic Acid, a violet coloration changing to deep brownish-red is produced, and that Sulphuric Acid containing a trace of Potassium Iodide Solution yields a dark red coloration, changing to deep purple, and that Sulphuric Acid containing about one-fifth of its volume of Formaldehyde Solution produces a deep purplish-red colour. Salicin may be distinguished from alkaloids by yielding, when dissolved in Water, neither a precipitate with Potassio-mercuric Iodide (Mayer's) Solution, nor with Tannic nor with Picric Acid Solutions, nor the other usual reagents for alkaloids. When ignited with free access of air it should leave no residue; the latter requirement is common to both the *B.P.* and the *U.S.P.*

Not Official.

SALIGENIN.—Small, tabular crystals, having a very faint, sweetish taste, soluble in Water, readily soluble in Alcohol (90 p.c.) and in Ether. It is obtained by the action of Formic Aldehyde on Phenol in alkaline solution, or by the action of emulsin or of diluted mineral acids on Salicin. It has been recommended in acute rheumatism and in gout.—*P.J.* (3) xxv. 755, 1115; '95, ii. 175. **Dose.**—4 grains = 0·26 gramme.

SALINIGRIN.—Was found by Jowett (*J.C.S. Trans.* '00, 707) in an examination of a bark purchased as that of Black Willow, but which could not be, however, identified then as other than some species of *Salix*; the crystalline substance possessed a m.p. of 193° C. (379·4° F.) Corr. Its aqueous solution had an optical rotation of − 85°, the substance gave no coloration with Sulphuric Acid, on hydrolysis it yielded a crystalline Meta-hydroxybenzaldehyde.

SALIX NIGRA.—The Bark has been recommended as a sexual and general sedative.—*B.M.J.* '87, ii. 237; *L.* '88, i. 869.

The dose of the **Fluid Extract** (1 in 1) is 30 to 60 minims = 1·8 to 3·6 c.c.

SALOL.

PHENYL SALICYLATE.

$C_7H_5O_3.C_6H_5$, eq. 212·47.

FR., SALICYLATE DE PHÉNYLE; GER., PHENYLSALICYLAT; ITAL., SALOLO; SPAN., SALICILATO DE FENOL.

Colourless, translucent, needle-shaped crystals, or a white crystalline powder, possessing a peculiar and characteristic aromatic odour, and but a slight taste. It is the Salicylic Ester of Phenyl.

Solubility.—1 in 12 of Alcohol (90 p.c.), 2 in 1 of Ether, 3 in 1 of Chloroform; 1 in 4 of Almond Oil; 1 in 10 of Liquid Paraffin. Insoluble in cold Water.

Medicinal Properties.—Antipyretic, antiseptic, and intestinal disinfectant. It passes through the stomach unchanged, and is decomposed into Carbolic and Salicylic acids by the alkalinity of the small intestine. It has been recommended in acute and chronic rheumatism, in cholera, in typhoid fever, in intestinal tuberculosis and in smallpox. One of the best antiseptics for intestinal dyspepsia and fermentation. Useful also as a urinary antiseptic. When given in excessive doses, or repeated frequently, has given rise to toxic symptoms. Externally it is used for the same purposes as Iodoform.

Combined with a blood tonic in anæmia, *M.A.* '95, 103; and pernicious anæmia, *L.* '94, ii. 1274; in diarrhœa of phthisis, *Pr.* liii. 275; in choleraic diarrhœa, *T.G.* '94, 40; good result in gonorrhœa, *L.* '90, i. 644; an intestinal and urinary disinfectant, *B.M.J.* '93, i. 643.

Owing to its low m.p. (about 108° F. = 42° C.) it is useful in filling up irregular or superficial bone cavities; also as a stopping for carious teeth.—*B.M.J.E.* '96, i. 64; *P.J.* '95, ii. 216.

Formation of Salol calculus from its internal administration.—*B.M.J.* '97, ii. 78; *P.J.* '97, ii. 446.

Has been used (*L.* '04, ii. 1209) in 10-grain doses as an internal antiseptic in ulcerative colitis.

10 to 20-grain doses, either alone or in emulsion, with Castor Oil and Gum Acacia as an intestinal antiseptic in dysentery. –*I.M.G.* '05, ii. 281.

In compressed form it is less reliable than when given in suspension in Petroleum Emulsion.—*B.M.J.* '05, ii. 1703.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Prescribing Notes.—*It is given in* **cachets, mixtures, powders,** *or Compressed Tablets. In mixtures it should be suspended with Compound Tragacanth Powder; but it is best dissolved in a fixed Oil, and emulsified by Gum Acacia* (see below *Emulsio Salol*). *Salol with* ⅛ *of Compound Tragacanth Powder, will make a good pill with 'Diluted Glucose.'*

A good **mouth-wash** *can be made by dissolving* 60 *grains of Salol in* 6 *fl. oz. of Alcohol* (90 *p.c.*), *and adding* 10 *minims of Oil of Peppermint and* 5 *minims of Oil of Anise. It can, if desired, be sweetened with an addition of* $\frac{1}{10}$ *grain of Saccharin.*

Not Official.—Emulsio Salol, Pommade de Salicylate de Phényle, Salol Camphor, Salol Mouth-wash, Salol Varnish for Pills, and Salophen.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Mex., Norw., Russ., Span., Swed., Swiss and U.S.

Tests.—Commercial Salol melts at 41·37° C. (106·46° F.); dried Salol melts at 42·53° C. (108·55° F.); purified Salol melts at 42·47° C. (108·44° F.). The *B.P.* gives the m.p. as 42° to 43° C. (107·6° to 109·4° F.). The *U.S.P.* and the *P.G.* 42° C. (107·6° F.). It dissolves readily in Alcohol, the alcoholic solution being neutral in reaction towards Litmus paper, and yielding on the addition of Bromine Solution a white precipitate, and on the addition of Ferric Chloride T.S. a violet coloration. The *U.S.P.* and the *P.G.* both employ diluted Ferric Chloride Solution in carrying out this test. When dissolved in a little warm Sodium Hydroxide Solution it yields when cooled and acidified with diluted Sulphuric Acid a white precipitate, and on warming, an odour of Phenol. The *B.P.* states that when Salol is melted with Sodium Hydroxide and acidulated with Hydrochloric Acid a white precipitate is produced and Phenol is evolved. The object in using solid Sodium Hydroxide, when Potassium or Sodium Hydroxide Solution is equally convenient and far less troublesome, is not apparent. The separated Salicylic Acid, when washed and carefully dried should possess the m.p. and answer the tests distinctive of Salicylic Acid given under Acidum Salicylicum.

Bearing in mind the fact that Phenol forms no chemical combination with Sodium Hydroxide in the true sense of the term, any alkali Hydroxide being titratable with Normal Acid Solution as if no

Phenol were present, and with a standard acid forms a salt neutral to Phenolphthalein Solution, the author has suggested (*P.J.* '05, i. 720) a convenient method for approximately determining the purity of a salt by the Saponification equivalent:--A weighed quantity of 0·5 of a gramme of the sample is carefully weighed out into a flask, 5 c.c. of Normal Volumetric Sodium Hydroxide Solution added, and 10 c.c. of Water, the mixture saponified on a water-bath; it is cooled, the excess of Normal Volumetric Sodium Hydroxide Solution titrated with Tenth-normal Volumetric Sulphuric Acid Solution. A carefully measured 5 c.c. of the Normal Alkali Solution is treated in an exactly similar manner as a blank experiment, the difference of the number of c.c. of Tenth-normal Volumetric Sulphuric Acid Solution required for the specimen and that required in the blank experiment is calculated into terms of Phenyl Salicylate. 1 c.c. of Tenth-normal Sodium Hydroxide Solution absorbed represents 0·005571 gramme of Potassium Hydroxide or 0·021247 gramme of Phenyl Salicylate.

The more generally occurring impurities are uncombined Salicylic Acid or Phenol, Sulphates and Chlorides. The free acid, if present, may be detected by the behaviour of the sample or its solution towards blue Litmus paper. When shaken with 50 times its weight of Water and filtered the filtrate should neither afford a blue nor a violet coloration with diluted Ferric Chloride T.S. (the *B.P.* says Ferric Chloride Solution), nor should it produce a turbidity with Silver Nitrate or Barium Chloride Solutions. When heated with free access of air it should leave no weighable residue. The *P.G.* states that 0·1 of a gramme when ignited shall leave no weighable residue.

Ferric Chloride.—If 1 gramme of Phenyl Salicylate be shaken with 50 c.c. of Water and filtered; and if 5 drops of Ferric Chloride T.S., previously diluted with 20 volumes of Water be added to the filtrate, the latter should show either no colour or at most a trace, *U.S.P.* Also given in the *P.G.*, which states that the filtrate should not be affected.

Barium Nitrate.—A filtrate obtained as above should be unaffected by T.S. of Barium Nitrate, *P.G.*; should show no turbidity, *U.S.P.*

Silver Nitrate.—Another portion of a filtrate as above should be unaffected by T.S. of Silver Nitrate, *P.G.*; should show no turbidity, *U.S.P.*

Not Official.

EMULSIO SALOL.—Salol, 40 grains; Almond Oil, 4 fl. drm.; Powdered Gum Acacia, 120 grains; Syrup, 2 fl. drm.; Peppermint Water, to 2 fl. oz.

POMMADE DE SALICYLATE DE PHÉNYLE.—Phenyl Salicylate, 1; Vaseline, 9.—*Fr.*

SALOL CAMPHOR.—Prepared by moistening 1 of Camphor with Alcohol and triturating it with 1½ Salol till a transparent liquid is obtained. Has been found useful in treament of furuncles and carbuncles.—*B.M.J.E.* '95, ii. 84.

SALOL MOUTH-WASH.—Salol, 60 grains; Oil of Peppermint, 10 minims; Oil of Anise, 5 minims; Alcohol (90 p.c.), to 6 fl. oz. It can, if desired, be sweetened with an addition of $\frac{1}{10}$ grain of Saccharin.

A modification appears in the *B.P.C.*, under the title **Liquor Salolis Compositus**, with the synonym Salol Mouth-Wash as follows:—

Salol, 2·50; Thymol, 0·25; Spirit of Anise, 1; Oil of Peppermint, 0·50; Elixir of Gluside, 2·50; Alcohol, *q.s.* to produce 100.

SALOL VARNISH FOR PILLS.—Salol, 2; Shellac, 3; Absolute Alcohol, 3; Ether, 3.—*Martindale.*

This has been incorporated in the *B.P.C.* under the title **Solutio Salolis Etherea,** with the synonym Salol Pill Varnish as follows:—

Salol, 20; Shellac, 30; Ether, 30; Absolute Alcohol, *q.s.* to produce 100.

SALOPHEN. Acetylparamidophenol Salicylate $C_{15}H_{13}NO_4$, eq. 269·11.—A white, crystalline powder, insoluble in Water, soluble in Alcohol and in Ether.

It appears in the *Fr. Codex* (1908) under the title of Acétylpara-aminosalol.

Medicinal Properties.—Analgesic and antipyretic. Has been recommended in acute and subacute rheumatism, and in neuralgia.

Dose.—10 to 30 grains = 0·65 to 2 grammes, usually given in cachets.

Official in Belg., Fr., Mex., Swed. and Swiss.

Tests.—Salophen melts at 187° to 188° C. (368·6° to 370·4° F.); *Fr. Codex* gives 188° C. (370·4° F.). It dissolves in Alcohol, forming a solution which is faintly acid towards Litmus paper, and which is coloured violet by the addition of Ferric Chloride T.S., and which produces a voluminous white precipitate with Bromine Solution. It dissolves without change of colour in concentrated Sulphuric Acid. Potassium or Sodium Hydroxide Solution readily decomposes it into Salicylic Acid and Acetyl-para-amidophenol. The *Fr. Codex* includes a test for the acetyl radicle, requiring that when moderately heated with a mixture of Alcohol and Sulphuric Acid it shall evolve an odour of Acetic Ether. The liberated Salicylic Acid, when separated, washed and carefully dried, should possess the m.p. and respond to the tests characteristic of Salicylic Acid given under Acidum Salicylicum.

SAMBUCI FLORES.

ELDER FLOWERS.

Fr., Sureau; Ger., Holunderblüthen; Ital., Sambuco; Span., Sauco.

The Flowers of *Sambucus nigra*, L., separated from the stalks.

Descriptive Notes.—The official description does not specify whether the Elder flowers should be fresh or not, but under Aqua Floræ Sambuci the fresh flowers are ordered. The flowers should be separated from the flower stalks. In the West of England the dried flowers are commonly sold as a remedy for catarrh, the whole inflorescence being dried. The flowers readily blacken if left in heaps, and need to be quickly dried in a current of warm air in order to keep their colour. The small rotate corolla is nearly white when fresh, but dull yellowish-white when dried. The anthers are yellow; in the only other British species, *S. Ebulus,* they are pink. The fresh flowers have a slightly bitter taste and a faint but characteristic odour. In the United States the allied species *S. Canadensis*, L., was official, and is still in use. It differs from the British species chiefly in the leaves having 3 to 4 pairs of leaflets and in being sometimes bipinnate, but the flowers present no marked difference.

Official Preparation.—Aqua Sambuci.

Not Official.—Unguentum Sambuci, Unguentum Sambuci (Viride).

Foreign Pharmacopœias.—Official in all except U.S. Fr. (Sureau) Ital. (Sambuco); Mex. and Span. (Sauco); Port. (Sabugueiro).

Preparation.

AQUA SAMBUCI. ELDER-FLOWER WATER.

Fresh Elder Flowers, 1 (or an equivalent quantity of the Flowers preserved whilst fresh with Common Salt); Water, 5; distil 1.

(1 in 1)

Chiefly used for **lotions** and **collyria**.

Not Official.

UNGUENTUM SAMBUCI.—Elder Flowers, fresh; Lard, of each, 16 oz. Boil the Elder Flowers in the Lard until they become crisp; then press through a linen cloth.—*P.L.* 1851.

This has been incorporated in the *B.P.C.*

UNGUENTUM SAMBUCI (VIRIDE).—Elder Leaves, fresh, 3; Prepared Lard, 4; Prepared Suet, 2; boil the leaves with the Lard till they become crisp, strain, express, add the Suet and melt them together.—*Dublin Pharm.*

This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in Port. 1 in 4.

SANTALI OLEUM.

OIL OF SANDAL WOOD.

B.P.Syn.—OIL OF SANTAL WOOD.

FR., ESSENCE DE SANTAL; GER., SANDELÖL; ITAL., ESSENZA DI SANDALO; SPAN., ESENCIA DE SANDALO.

A pale yellow, or yellow, somewhat viscid, oily liquid, having a characteristic, persistent, aromatic odour, and unpleasant, nauseous taste.

It should be kept in well-closed bottles of a dark amber tint in a cool atmosphere and protected as far as possible from contact with the light.

It is distilled from the Wood of *Santalum album*, L.

East Indian Sandal Wood Oil is alone official in the *B.P.*; the *U.S.P.* requires the Oil to contain not less than 90 p.c. of alcohols calculated as Santalol, the *P.G.* does not state the necessary proportion of Santalol.

The chief constituent of the Oil is an alcohol Santalol, which is capable of determination by acetylisation.

Solubility.—In less than its own weight of Alcohol (90 p.c.).

Medicinal Properties.—A stimulating disinfectant to the mucous membranes of the bladder and urethra, and also of the bronchial mucous membrane; prescribed extensively for subacute and chronic gonorrhœa; it is best taken about an hour and a half after meals.

Dose.—5 to 30 minims = 0·3 to 1·8 c.c.

Prescribing Notes.—*Generally given in* **capsules** *or in a* **mixture** *suspended with Mucilage of Acacia, or Tragacanth. It is best taken in Capsules, as the taste is nauseous. Sometimes prescribed with Buchu and Cubebs.*

Not Official.—Capsules of Sandal Oil, Liquor Santali Compositus, Mistura Olei Santali, Mistura Santali Composita, Mistura Santali Composita cum Morphina, Mistura Olei Santali, Gonal and Santyl.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Fr., Ger., Jap., Norw., Span., Swiss and U.S.

Tests.—Sandal Wood Oil has a sp. gr. of 0·975 to 0·985. The *B.P.* states 0·975 to 0·980; the *U.S.P.* 0·965 to 0·980 at 25° C. (77° F.); the *P.G.* 0·975 to 0·985. It is officially required to dissolve in six times its volume of Alcohol (70 p.c.), to form a clear solution, but it must be remembered that the solubility of the Oil decreases with age and that an Oil which has been kept a considerable time or which has been badly preserved may not give a clear solution. The *U.S.P.* requires that it should dissolve in 5 volumes of Alcohol (70 p.c.) presumably at 25° C. (77° F.). The *P.G.* is more specific with regard to the temperature at which solution in this volume of Alcohol is required to take place, and states that it shall dissolve in 5 parts, by weight, of Alcohol (68 to 69 p.c.) at 20° C. (68° F.) to form a clear solution possessing a faintly acid reaction. The temperature at which solution is required to be effected should have been mentioned in the *B.P.*, as it makes a considerable difference whether the solubility figure is determined at 15·5° C. (60° F.), 20° C. (68° F.) or 25° C. (77° F.). It is lævogyrate, the optical rotation being from −16° to −20° in a tube of 100 mm. length. These are the figures required by the *B.P.* The *U.S.P.* requires that the optical rotation should not be less than −16° nor more than −20° in a 100 mm. tube at a temperature of 25° C. (77° F.). The *P.G.* does not state the optical rotation. Considerable controversy has raged round the question of the optical rotation, it being contended that specimens of undoubted purity (English distilled) are occasionally outside these limits, and rotations of −14° to −22° have been recorded. The majority of evidence appears to be in favour of the −16° to −20° limit, it not being considered a good policy to widen the official limits in order to include a few exceptional oils possessing a rotation outside the above limits. The optical rotation has been considered fallacious in judging the purity of an Oil, but it must be recollected that it frequently supplies important information as to the nature of the substance with which an Oil is adulterated. The refractive index should be not below 1·503. The alcohol-content of the Oil calculated in terms of Santalol should not fall below 90 p.c. Neither the *B.P.* nor the *P.G.* gives a requisite Santalol content, the *U.S.P.* requires that it shall contain not less than 90 p.c. of alcohols calculated as Santalol, as determined by the process given in small type below. A Santalol determination figure, possibly 94 p.c. as a minimum, has been suggested for inclusion in the *B.P.* All authorities are agreed that the Santalol content for a genuine Oil should not fall below 90 p.c., but the majority consider that although the total amount of Santalol present in Oils of undoubted purity rarely falls below 94 p.c., the standard is somewhat too high for official adoption, and that it would be wiser to adopt the standard suggested by Parry and Schimmel of at least 90 p.c. Besides the alcohol, Santalol, the Oil also contains esters of that Alcohol present chiefly in the form of Acetate; their percentage varies from 2 to 6 p.c. and they may be determined by saponifying a known weight of the Oil with Semi-normal Volumetric Alcoholic Potassium Hydroxide Solution, titrating the excess of the latter solution with Semi-normal Volumetric Sulphuric Acid Solution, using Phenolphthalein Solution as an indicator of neutrality. The number of c.c. of Semi-normal Volumetric Alcoholic Potassium Solution absorbed by the Oil multiplied first by 0·1301 and then by 100, and the product divided by the weight of Oil taken, yields the percentage of esters in terms of Santalol Acetate. Neither the *B.P.*, the *U.S.P.* nor the *P.G.* includes figures for an ester content. In carrying out the volumetric determination of Santalol-content, in the place of washing the acetylised Oil with Water, whereby, owing to the formation of an emulsion, a fair quantity of the Oil is lost, it has been suggested (*Proc. Amer. Pharm. Assoc.* '06, 887) that a 10 p.c. Sodium Chloride Solution should be used. The formula by which the Santalol content should be calculated is also a matter of importance. Schimmel states that Santalol is correctly represented by the formula $C_{15}H_{24}O$, which is the only one which ought to come under consideration.

The more generally occurring impurities are Oils derived from other varieties of Sandal Wood, Cedar Wood Oil, Castor Oil, or other fixed Oils and Rosin. The *U.S.P.* includes a test for chlorinated products, which is described under Silver Nitrate. The solubility of the Oil in Alcohol (70 p.c.) detects the presence of Castor Oil or other fixed Oils or West Indian Sandal Wood Oil. Cedar Wood Oil, Castor Oil or fixed Oils and Rosin may also be detected by the Acid and Ester values and the decrease in the optical rotation, as well as by the diminution in the percentage of Santalol. It is stated (*Analyst*, '95, 174) that genuine Sandal Wood Oil gives with Bromide of Tin (*see* Oleum Lini) a red coloration, whilst West Indian Sandal Wood Oil gives a blue or a green colour. The paucity of information contained in the official monograph suggests a recommendation to the effect that the *B.P.* monograph requires revision.

Silver Nitrate.—If a small strip of of filter paper folded in the form of a taper and saturated with Oil of Santal be placed in a small porcelain dish, and a clean beaker moistened on the inner surface with Distilled Water be inverted over the small dish immediately after igniting the taper, a part of the products of combustion will be absorbed by the Water; if the beaker be then rinsed with a little Distilled Water and the liquid filtered, the filtrate should yield no turbidity upon the addition of a few drops of Silver Nitrate T.S., *U.S.P.*

Volumetric Determination of Santalol.—A measured quantity of 10 c.c. is introduced into an acetylisation flask, together with 10 c.c. of Acetic Acid Anhydride, and about 2 grammes of anhydrous Sodium Acetate, and the mixture is boiled gently for 1½ hours, when cool the acetylised Oil is washed first with Distilled Water and subsequently with Sodium Hydroxide T.S., until the mixture is faintly alkaline to Phenolphthalein T.S., and it is then dried by means of fused Calcium Chloride. Filter and transfer 3 c.c. of the dried acetylised Oil into a flask having a capacity of 100 c.c., and after having ascertained accurately the weight, saponify by boiling gently for 1 hour under a reflux condenser with 50 c.c. of Semi-normal Volumetric Alcoholic Potassium Hydroxide Solution, titrating the excess of the latter with Semi-normal Volumetric Sulphuric Acid Solution, employing Phenolphthalein Solution as an indicator of neutrality. The number of c.c. of Semi-normal Volumetric Sulphuric Acid Solution required is subtracted from 50, the difference is multiplied by 11·026 and the product divided by the weight of the dry acetylised Oil employed (minus the number of c.c. of Semi-normal Volumetric Alcoholic Potassium Hydroxide Solution absorbed by the acetylised Oil multiplied by 0·021), the quotient corresponds to the p.c. of Santalol present in the sample.—*U.S.P.*

Not Official.

CAPSULES OF SANDAL OIL.—Containing 10 and 20 minims in each.

The Oil used in these capsules is frequently adulterated, Castor Oil, flavoured with Sandal Wood Oil, has been used for this purpose, but, of course, is readily detected. The favourite adulteration is Oil of West Indian Sandal Wood, this has been reported (*C.D.* '06, i. 211) in specimens of capsules manufactured in London, it may be recognised by tests given under Oleum Santali.

LIQUOR SANTALI COMPOSITUS.—Sandal Wood Oil, 1; Soluble Solution of Copaiba, 22; Spirit of Cinnamon, ½; Tincture of Buchu (1 in 5 S.V.R.), 3½; Tincture of Cubebs (1 in 5 S.V.R.), 3.—*Pharm. Form.*

Oil of Sandal Wood, 5; Spirit of Cinnamon, 2·50; Tincture of Buchu, 17; Tincture of Cubebs, 15; Alcohol, *q.s.* to produce 100.—*B.P.C.*

MISTURA OLEI SANTALI.—Oleum Santali, 30 minims; Mucilage of Acacia, 1 fl. drm.; Syrup, 1 fl. drm; Tincture of Orange, 30 minims; Water, to 1 fl. oz., for a dose 3 times a day.—*Squire.*

Mistura Olei Santali.—Oil of Sandal Wood, 15 minims; Mucilage of Gum Acacia, 30 minims; Cinnamon Water, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

MISTURA SANTALI COMPOSITA.—Sandal Wood Oil, 12½ drm.; Oil of Cassia, 1½ drm.; Oil of Pimento, 40 minims; Rectified Spirit, 3½ oz. (Nisbet's Specific).—*Pharm. Form.*

Oil of Sandal Wood, 30; Oil of Cassia, 3·50; Oil of Pimento, 1·50; Alcohol, *q.s.* to produce 100.—*B.P.C.*

MISTURA SANTALI COMPOSITA CUM MORPHINA.—Sandal Wood Oil, 4 oz.; Oil of Pimento, 4 drm.; Oil of Cassia, 2 drm.; Morphine Muriate, 9 grains; Rectified Spirit, to produce 12 oz. (Nisbet's Specific).—*Pharm. Form.*

Oil of Sandal Wood, 35; Oil of Cassia, 2·25; Oil of Pimento, 4·50; Morphine Hydrochloride, 0·15; Alcohol, *q.s.* to produce 100.—*B.P.C.*

GONAL.—A colourless, oily liquid, sp. gr. 0·978 to 0·980, containing the alcohol constituents of Sandal Wood Oil. It has a faint odour of the latter. An irritating, sesquiterpene Santalene is stated to be removed during its preparation. Introduced as a purified Sandal Wood Oil, and recommended for urethritis and gonorrhœa. **Gonoral** was a somewhat similar preparation.—*B.M.J.* '01, i. 1407; '01, ii. 512; *P.J.* '99, ii. 34; '00, i. 333.

SANTYL.—A clear, yellow fluid of an oily consistency, possessing a faint odour and taste of Sandal Wood. It is practically insoluble in Water, but dissolves in Alcohol (90 p.c.) and in Ether. It is stated to be a neutral Santalol Salicylic Ester, and to contain 60 p.c. of Santalol. It was introduced as a urinary antiseptic, and is stated to be of value in acute gonorrhœa and its complications, being comparatively free from the somewhat objectionable odour and taste of Sandal Wood Oil. It is stated not to cause eructations, nor to impart a Sandal Wood odour to the breath. It may be given in doses of 30 drops taken 3 times daily, preferably in Milk or in the form of Capsules, 2 capsules being taken 4 times a day.

SANTONINUM.

SANTONIN.

$C_{15}H_{18}O_3$, eq. 244·29.

FR., SANTONINE; GER., SANTONIN; ITAL., SANTONINA; SPAN., SANTONINA.

Colourless, odourless, pearly, hexagonal prisms, possessing a faint bitter taste. It is a crystalline principle, which is prepared from Santonica, or Worm-Seed, the dried, unexpanded Capitula or

Flower-Heads of *Artemisia maritima*. The *U.S.P.* describes it as an inner Anhydride or Lactone of Santonic Acid obtained from Santonica.

It should be kept in well-closed bottles of a dark amber tint and protected as far as possible from the light, as it acquires, when exposed to the light, more particularly to direct sunlight, a yellow colour.

Solubility.—Sparingly in Water; 1 in 350 of boiling Water; 1 in 50 of Alcohol (90 p.c.); 1 in 4 of boiling Alcohol (90 p.c.); 1 in 160 of Ether; 1 in 2 of Chloroform; about 1 in 400 of Olive Oil; slightly in Glycerin and in Solution of Potassium Hydroxide.

Medicinal Properties.—Anthelmintic. Useful both for round worms and thread-worms. It frequently affects the vision, causing all objects to appear yellow or green; to avoid this unpleasantness, Santonin is given at night, the disturbance of vision then remains only for half an hour or so, after the patient awakes in the morning.

Apart from its tænicide action, it is stated to possess valuable antispasmodic properties.—*P.J.* '04, ii. 967; *C.D.* '04, ii. 1052. It is useful in certain nervous affections, in epilepsy, and against tabetic pains.

A case of a child age 3½ years, is recorded, in which, after it had received at intervals during 40 hours several 'worm lozenges' containing Santonin, a fatal issue ensued. A little over 1 grain of Santonin had thus been taken, or about half the maximum dose for a child of 2 years per day. Other cases have been recorded in which equally small doses have produced toxic effects.—*Edin. Med. Jour.* '08, i. 183.

Dose.—2 to 5 grains = 0·13 to 0·32 gramme.

Ph. Ger. maximum single dose, 0·1 gramme; maximum daily dose, 0·3 gramme.

Prescribing Notes.—*About* 3 *doses are sufficient;* 1 *every other night followed by a brisk cathartic the morning after each dose. The suppository is useful in thread-worms.*

Castor Oil has been recommended as a solvent for Santonin, but it will not dissolve 1 *in* 100; *even if heat be applied, part of the Santonin will crystrallise out on cooling.*

Official Preparation.—Trochiscus Santonini.

Not Official.—Suppositorium Santonini, Pulvis Santonini Compositus Infantilis, Pulvis Santonini et Scammonii, and Artemisin.

On account of the similarity in crystalline form, and in consequence of several accidents due to the contamination of Santonin with Strychnine, *Ger.* and *U.S.* include a test for the latter substance.

Foreign Pharmacopœias.—Official in all.

Tests.—Santonin melts at 170° C. (338° F.), and if cautiously heated it may be sublimed unchanged; the *U.S.P.* gives the m.p. as 170·3° C. (338·5° F.); the *P.G.* 170° C. (338° F.). When more strongly heated it acquires a reddish-brown colour, evolving white fumes. It is soluble in Potassium or Sodium Hydroxide Solutions, and when added to a warm alcoholic Solution of the former it yields a violet-red coloration. It dissolves in Alcohol, the solution being lævogyrate and neutral in reaction towards Litmus paper. When moistened with Sulphuric Acid or Nitric Acid no coloration is produced. It is insoluble in diluted mineral acids. If 0·1 of a gramme be shaken with 1 c.c. of a cold mixture of Sulphuric Acid, and 1 c.c. of Water, no coloration should be produced, but on heating to 100° C. (212° F.), the addition of a drop of diluted Ferric Chloride T.S. a purple-violet coloration is produced, changing to brown on long continued heating. Crystals of Santonin are somewhat similar in appearance to Strychnine, and in fact have been mistaken for that substance, and tests for Strychnine, Brucine and alkaloids have been inserted in the *U.S.P.* and *P.G.* The test for Strychnine and Brucine is described under the heading of Potassium Bichromate, and the test for other alkaloids under the heading of Mercuric Potassium Iodide or Iodine in small type below. When ignited with free access of air it should leave no residue, indicating the absence of mineral impurity. The *U.S.P.* states that when ignited it is consumed, leaving no residue, and the *P.G.* that 0·2 of a gramme of the substance shall leave no residue when ignited.

Potassium Bichromate.—If Santonin be boiled with 100 parts of Water and 5 parts diluted Sulphuric Acid, after cooling and subsequently filtering it gives a filtrate without any bitter taste, and in which the addition of a few drops of Potassium Bichromate T.S. does not produce a precipitate, *P.G.*

Mercuric Potassium Iodide or Iodine—If 2 grammes of Santonin be boiled with 80 c.c. of Water and 5 c.c. of Diluted Sulphuric Acid, and the liquid, after frequent shaking be allowed to become cold and then filtered, Mercuric Potassium Iodide T.S. or Iodine T.S., should produce no cloudiness in 10 c.c. of the filtrate, mixed with 10 c.c. of Distilled Water, even after standing for 3 hours (absence of alkaloids), *U.S.P.*

Preparation.

TROCHISCUS SANTONINI. SANTONIN LOZENGE.

1 grain of Santonin in each lozenge, with Simple Basis.

Dose.—1 to 5 lozenges.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Ger., Ital., Mex., Norw., and Swiss, each containing ⅜ grain; Dan., Russ., Swed. and U.S. ½ grain; Fr. and Port., ⅙ grain; Jap. and Span., ⅓ grain. Not in Hung.

Not Official.

SUPPOSITORIUM SANTONINI.—Santonin 3 grains, with Oil of Theobroma.

PULVIS SANTONINI COMPOSITUS INFANTILIS.—Santonin, 1 grain; Calomel, ½ grain; Compound Powder of Scammony, 2½ grains.—*London.*

PULVIS SANTONINI ET SCAMMONII.—Santonin, 1 grain; Compound Powder of Scammony, 2 grains.—*Victoria.*

Artemisin (Oxysantonin) occurs in colourless crystals, becoming yellow on exposure to light, and is extracted from the mother liquors after separating the Santonin.—*P.J.* '02, i. 294, 489; *C.D.* '02, i. 14.

15 grains given in 3 doses at intervals of 3 hours to relieve the lightning pains of tabes.—*B.M.J.E.* '01, i. 80; *T.G.* '01, 613.

SAPO ANIMALIS.

CURD SOAP.

FR., SAVON ANIMAL; GER., HAUSSEIFE; ITAL., SAPONE ANIMALE;
SPAN., JABON ANIMAL.

A white or whitish solid, possessing a characteristic appearance, dry and saponaceous to the touch. It is prepared by the saponification of a purified animal fat with Sodium Hydroxide.

Sapo Animalis is described in the *P.G.* under the title of Sapo Medicatus, it is not official in the *U.S.P.*

For the purpose of powdering it is not affected injuriously by drying at a temperature of 212° F. (100° C.).

Solubility.—Sparingly in Water; 1 in 1½ of boiling Water; partially in Alcohol (90 p.c.); almost entirely, 1 in 2 of boiling Alcohol (90 p.c.).

Official Preparations.—Used in the preparation of Extractum Colocynthidis Compositum, Linimentum Potassii Iodidi cum Sapone, and Pilula Scammonii Composita.

Foreign Pharmacopœias.—Official in Austr. (Sapo Medicinalis); Belg. (Sapo Stearinicus); Norw. (Sapo Butyraceus); Fr., (Savon Animal); Hung. (Sapo Albissimus Droguistarum); Ital. (Sapone Animale); Port. (Sabao Animal); Russ. (Sapo Sebacinus); Mex. and Span. (Jabon Animal); Swiss (Sapo Stearinicus); Ger., Jap. and Russ. (Sapo Medicatus), made with Lard and Olive Oil.

Emplastrum Saponis.—Formerly made with Curd Soap; now made with Hard Soap. *See* Sapo Durus.

Tests.—Curd Soap dissolves sparingly in Water and readily in boiling Water, is sparingly soluble in Alcohol (90 p.c.). The *B.P.* requires that it shall contain no free alkali Hydroxide as determined by dissolving a weighed quantity of 5 grammes of the dried and powdered Soap in boiling Alcohol (90 p.c.), filtering whilst hot and washing the filter with boiling Alcohol (90 p.c.), using Phenolphthalein Solution as an indicator of neutrality. It is officially required to contain not more than 0·3 p.c. of alkali (Sodium) Carbonate as determined by dissolving in Water the residue resulting from the filtration of the boiling alcoholic solution of the Soap and washing with boiling Alcohol (90 p.c.). This aqueous solution is titrated with Tenth-normal Volumetric Sulphuric Acid Solution, using Phenolphthalein Solution as an indicator of neutrality; not more than 3 c.c. of the Tenth-normal Sulphuric Acid Solution shall be required; 1 c.c. of the latter solution is equivalent to 0·00526 gramme of anhydrous Sodium Carbonate. The use of Phenolphthalein Solution as an indicator of neutrality will necessitate the boiling of the solution to dispel the Carbonic Anhydride. It would have been preferable to have used Methyl Orange Solution as an indicator, when the titration could have been carried out directly. If it is desired to ascertain the amount of alkali combined with the fatty acids in the form of a Soap, a few drops of Lacmoïd Solution may be added and the titration continued until a red coloration is produced. The number of c.c. of Tenth-normal

Volumetric Acid Solution used may be calculated into Sodium Oxide, 1 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution is equivalent to 0·00308 gramme of Sodium Oxide. The *P.G.* requires that a solution of 1 gramme of Soap and 5 c.c. of Alcohol (90 p.c.) shall not acquire a red coloration on the addition of 1 drop of Phenolphthalein Solution. The *B.P.* includes no mention of the characters of the fatty acids obtained when an aqueous solution of the Soap is acidified with Diluted Sulphuric Acid, and the resulting fatty acids are filtered through a filter paper moistened with Water, washed till free from mineral acids and dried. They should possess the m.p. of about 45° C. (113° F.), an Iodine absorption of about 40 to 45 p.c., and a combining weight of about 278 to 280.

The more generally occurring impurities are the presence of an excess of alkali Hydroxide, an excessive amount of alkali Carbonate, unsaponified oil or fat, Potassium Soap or excess of moisture. The behaviour of the filtered boiling Alcoholic Solution towards Phenolphthalein Solution and the titration of the hot aqueous solution of the residue left on the filter ensures the absence of free alkali Hydroxide, or an excessive amount of alkali Carbonate. Unsaponified oil or fat, if present, may be detected by a greasy stain being imparted by the Soap to white unglazed paper. The deliquescent nature of the ash remaining on ignition indicates the presence of Potassium Soap. It is officially required to lose when dried at a temperature of 110° C. (230° F.) about 30 p.c. of moisture. The *P.G.* requires that Hydrogen Sulphide Solution shall produce no change in a solution of 1 gramme of the Soap in 5 c.c. of Alcohol (90 p.c.).

SAPO DURUS.

HARD SOAP.

FR., SAVON MEDICINAL; GER., MEDIZINISCHE SEIFE; ITAL., SAPONE MEDICINALE; SPAN., JABON DE ACEITE DE OLIVAS.

A solid, answering to the description given under 'Sapo Animalis,' but made by saponifying Olive Oil with Sodium Hydroxide. It is officially permitted to contain about 30 p.c. of Water.

Sapo Animalis is essentially Sodium Stearate, and Sapo Durus is essentially Sodium Oleate, but no confirmatory tests appear in the Pharmacopœia.

Solubility.—The greater part is soluble 1 in 20 of Water; entirely 1 in 1½ of boiling Water; 1 in 2 of boiling Alcohol (90 p.c.).

30 grains of White Castile Soap digested for 4 days in 1 oz. of cold Alcohol (90 p.c.), only 24 grains were dissolved; when heated it all dissolved.

Medicinal Properties.—Laxative and antacid. Combined with Rhubarb, it is administered as an antacid in dyspepsia attended with constipation. Large and frequent doses are most effective in removing gall-stones. Hard Soap, but more frequently Soft Soap, is made into a lather with warm Water, for use as an enema, ½ to 1 oz. to a pint.

The **Liniment**, which is made with soft soap, is used as a counter-irritant, and is useful in sprains and rheumatic pains, and stiffness of joints.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Prescribing Notes.—*Best given in* **wafer paper** *or in* **cachets.**

Official Preparations.—Emplastrum Saponis, and Pilula Saponis Composita. Contained in Emplastrum Resinæ, Pilula Aloes Barbadensis, Pilula Aloes et Asafetidæ, Pilula Aloes Socotrinæ, Pilula Cambogiæ Composita, Pilula Rhei Composita, Pilula Scillæ Composita. Used in the preparation of Hydrargyri Oleas and Unguentum Zinci Oleatis. Soap Plaster is contained in Emplastrum Calefaciens, and Emplastrum Cantharidis. '

Not Official.—Linimentum Saponis, Spiritus Saponatus, Eunatrol.

Foreign Pharmacopœias.—Official in Belg. (Sapo Officinalis); Dan. and Dutch (Sapo Medicatus); Hung. (Sapo Venetus); Norw. (Sapo Albus Oleaceus); Russ. (Sapo Hispanicus Albus); Span. (Jabon de Sosa); Swed. (Sapo Medicatus); Swiss (Sapo Oleaceus); U.S. (Sapo). With **Almond Oil**—Fr. (Savon Médicinal); Hung. (Sapo Medicinalis); Ital. (Sapone Medicinale); Mex. (Jabon Medicinal); Port. (Sabao Vegetal); Span. (Jabon Amigdalino). With **Lard** and **Olive Oil**—Ger., Jap. and Russ. (Sapo Medicatus).

Tests.—Hard Soap dissolves in Water, and readily in boiling Water and in boiling Alcohol. The *B.P.* requires that it shall not contain any free alkali Hydroxide as determined by digesting a weighed quantity of 5 grammes of the dried and powdered Soap in boiling Alcohol (90 p.c.), and whilst still hot filtering the solution through a filter and thoroughly washing it with boiling Alcohol (90 p.c.); the resultant filtrate should not produce a pink coloration with Phenolphthalein Solution. It also requires that it shall contain not more than 0·3 p.c. of alkali (Sodium) Carbonate as determined by titrating the residue from the above alcoholic solution with Tenth-normal Volumetric Sulphuric Acid Solution, not more than 3 c.c. of the solution should be required; 1 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution is equivalent to 0·00526 gramme of Sodium Carbonate. The *U.S.P.* has a somewhat similar limit of alkalinity, but determines it by dissolving 5 grammes of the Soap in 50 c.c. of hot Water, and requires that when this solution is mixed with 3 c.c. of Tenth-normal Volumetric Oxalic Acid Solution the subsequent addition of a few drops of Phenolphthalein Solution should produce no pink or red tint. The alkali in combination of the fatty acids in the form of Soap may be determined as described under Sapo Animalis, by titrating the hot Alcoholic Solution used for the determination of the free alkali Hydroxide, with Tenth-normal Volumetric Sulphuric Acid Solution. The *U.S.P.* weighs the undissolved Sodium Carbonate from 20 grammes of Soap dissolved in Alcohol (94·9 p.c.), which should weigh not more than 0·8 gramme. Neither the *B.P.* nor the *U.S.P.* refers to the characters of the fatty acids obtained when an aqueous solution of the Soap is acidified with Diluted Sulphuric Acid. The liberated fatty acids filtered through a paper previously moistened with Water, washed till free from mineral acid and dried, should possess a m.p. of about 26° C. (78·8° F.), an Iodine absorption of about 80 p.c. and a combining weight of about 279·5.

The more generally occurring impurities are free alkali Hydroxide, excess of alkali Carbonate, animal fats, and fatty acids from Oils other than Olive, Silica and other accidental impurities, unsaponified oil, Potassium soap and excess of moisture. Free alkali Hydroxide or excess of alkali Carbonate may be detected by the behaviour of the solution towards Phenolphthalein Solution and by the figure yielded on titrating the hot aqueous solution of the residue remaining after the filtration of the alcoholic solution as referred to at the commencement of the article. Animal fats may be determined by the gelatinisation on cooling of the 25 p.c. solution of the Soap in Alcohol (94·9 p.c.); fatty acids from Oils other than Olive may be detected by determinations of the m.p., Iodine absorption, and combining weight of the separated fatty acids. Metallic impurities may be detected by the Ammonium Sulphide and Hydrogen Sulphide test on the 1–20 Soap solution. Silica and other accidental impurities may be detected by a residue insoluble in Alcohol (94·9 p.c.) and in Water. Unsaponified oil leaves a greasy stain when the Soap is rubbed on white unglazed paper. Potassium Soap yields a deliquescent ash when the specimen is ignited with free access of air. The *B.P.* requires that the Soap shall lose, when dried at a temperature of 110° C. (230° F.), about 30 p.c. of moisture. In determining the amount of moisture the *U.S.P.* places 0·5 of a gramme of Soap with 10 c.c. of Alcohol in a tared beaker containing 1 gramme of clean dry sand, and evaporates to dryness; drying the residue at 110° C. (230° F.) until of a constant weight. The *U.S.P.* requires that the loss should not exceed 36 p.c.

Preparations.

EMPLASTRUM SAPONIS. SOAP PLASTER.

Hard Soap, 6; Lead Plaster, 36; Resin, 1. Melt each ingredient separately at a low temperature; mix; evaporate, with constant stirring, to a proper consistence. (1 of Soap in $7\frac{1}{6}$)

Now made with Hard Soap instead of Curd Soap.

Emplastrum Saponis—U.S., 1 in 10; Emplastrum Saponatum—Austr., about 1 in 14; Dan., 1 in 11; Dutch 1 in 10; Ger. and Jap., about 1 in 17; Hung., about 1 in 15½; Norw., about 1 in 17; Russ., 1 in 17½; Swiss, 1 in 10; Emplastrum Saponaceum—Swed., 1 in 9; Emplasto de Jabon—Mex., 1 in 18; Emplastro de Sabao—Port., 1 in 12½; Emplasto de Jabon—Span., about 1 in 17; (Saponis Emplastrum Camphoratum) Belg., Lead Plaster 75, Yellow Wax 10, Hard Soap 10, Olei officinalis 3, Camphor 2. Austr. has also Emplastrum Saponatum Salicylatum, Soap Plaster 85, Yellow Wax 5, Salicylic Acid 10.

LINIMENTUM SAPONIS. *See* SAPO MOLLIS.

PILULA SAPONIS COMPOSITA. *See* OPIUM.

Not Official.

LINIMENTUM SAPONIS.—Soap, dried and granulated, 6; Camphor, in small pieces, 4·5; Oil of Rosemary, 1; Alcohol (95 p.c.), 72·5; Water, *q.s.* to make 100.—*U.S.P.*

SPIRITUS SAPONATUS.—Castile Soap, in shavings, 17·5; Alcohol (95 p.c.), 60; Water, *q.s.* to make 100. Dissolve and filter.—*U.S.N.F.*

Spiritus Saponatus of the *P.G.* is made by saponifying Olive Oil 6 with solution of Potassium Hydroxide 7, and adding Alcohol 30, and Water 17, all by weight.

Spiritus Saponatus of the *B.P.C.* is made by dissolving 65 of Soft Soap in sufficient Alcohol (90 p.c.) to produce 100.

EUNATROL (Sodium Oleate).—Under this proprietary title has been introduced a substance containing pure Sodium Oleate. Stated to be useful as a cholagogue. Yellowish-white fatty solid, possessing a faint odour of Oleic Acid. Best prescribed in pills or capsules. Dose, 10 to 15 grains = 0·65 to 1 gramme, twice daily.—*P.J.* '02, i. 6.

SAPO MOLLIS.

SOFT SOAP.

A yellowish-white, or yellowish-green, unctuous semi-solid.

The *B.P.* Soft Soap is prepared with Potassium Hydroxide and Olive Oil. The *U.S.P.* and the *P.G.* with Potassium Hydroxide, and Linseed Oil.

Solubility.—1 in 4 of Water; 1 in 1 of boiling Water; almost entirely 1 in 1 of Alcohol (90 p.c.).

Official Preparation.—Linimentum Saponis. Contained in Linimentum Terebinthinæ. **Soap Liniment** is contained in Linimentum Opii.

Not Official.—Sapo Kalinus Venalis, Solutio Saponis Ætherea, Spiritus Saponis Kalini, Mollin.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch and Jap. (Sapo Kalinus); Fr. (Savon Noir); Ger., Hung., Russ., Swed. and Swiss (Sapo Kalinus and Sapo Kalinus Venalis); Ital. (Sapone di Potassa); U.S. (Sapo Mollis); Dutch has also Sapo Superadipatus, Wool Fat 4, Soft Soap 20, Hard Soap 76. Jap. and Swiss have also Sapo Veridis.

Tests.—Soft Soap dissolves in cold Alcohol (90 p.c.), and readily in hot Alcohol (90 p.c.). It is officially required to yield no free alkali Hydroxide as determined by digesting 5 grammes in boiling Alcohol (90 p.c.), filtering and adding a few drops of Phenolphthalein Solution to the filtrate, which should not afford a red or a pink coloration. The *U.S.P.* does not differentiate between the free alkali Hydroxide or the Carbonated alkali, but requires it to conform to the tests given below under the heading of Tenth-normal Volumetric Oxalic Acid Solution. The *P.G.* requires that a solution of 10 grammes of Soap in 30 c.c. of Alcohol (90 p.c.) shall remain clear after the addition of 0·5 c.c. of Normal Volumetric Hydrochloric Acid Solution, and on the further addition of 1 drop of Phenolphthalein Solution shall not assume a red coloration. The *B.P* fixes the limit of alkali Carbonate at 0·41 p.c. as determined by titrating the solution in hot Water of the residue insoluble in boiling Alcohol (90 p.c.). The use of Phenolphthalein Solution as an indicator of neutrality is recommended, but Methyl Orange Solution is more suited to the purpose, for the reason stated under Sapo Durus. Neither the *U.S.P.* nor the *P.G.* includes a volumetric test for limit of alkali Carbonate. The *B.P.* fixes the limit of Potassium Carbonate, insoluble Soaps, etc., as determined by the weight of residue insoluble in hot Alcohol (90 p.c.), at 3 p.c.; the *U.S.P.* allows a similar limit for the amount of residue insoluble in hot Alcohol (94·9 p.c.). No official mention is made as to the characters of the fatty acids, and consequently no confirmation is afforded that the particular Oil recommended in the official method of preparation has been employed in the manufacture of the Soap. To ascertain these characters the Soap is dissolved in Water, the aqueous solution acidified with Hydrochloric Acid, and the liberated fatty acids filtered through a filter paper previously moistened with Water, washed till free from mineral acid and carefully dried. They should possess a m.p. of about 26° C. (78·8° F.), an Iodine absorption of about 85 p.c., and a combining weight of 275 to 285. The *U.S.P.* does not include any methods for the examination of the fatty acids. The *P.G.* states that the fatty acid content of Sapo Kalinus Venalis amounts to at least 40 p.c. as determined by the process given in small type below. It has been recommended that a limit of Water should be added. The Soap may contain unsaponified oil or may be coloured with Copper salts, or be prepared by the saponification of Oils other than Olive. When rubbed on a piece of white glazed paper it should not impart an oily stain. When incinerated with free access of air it should yield an ash of a very deliquescent nature, which, when dissolved in diluted Hydrochloric Acid and tested with Hydrogen Sulphide, should not afford a brown coloration or precipitate, and which should impart a violet colour to a non-luminous flame. The presence of Oils other than Olive may be detected by the determination of the m.p., the Iodine absorption, and combining weight of the fatty acids, obtained as above.

Alcohol.—If 1 volume of a cooled solution of 5 grammes of Sapo Kalinus Venalis in 10 c.c. of hot Water be mixed with 1 volume of Alcohol, the mixture should remain clear, and even after the addition of 2 drops of Hydrochloric Acid a flocculent precipitate should not separate, *P.G.*

Tenth-normal Volumetric Oxalic Acid Solution.—A solution of 5 grammes of Soft Soap in 50 c.c. of Water with 2 drops of Phenolphthalein T.S. added should require not less than 2·3 c.c. nor more than 4·5 c.c. of Tenth-normal Oxalic Acid Volumetric Solution to discharge the red tint, *U.S.P.*

Determination of the Fatty Acids.—Dissolve 5 grammes of Soft Soap in 100 c.c. of hot Water. Mix the solution with 10 c.c. of diluted Sulphuric Acid in a test-glass and warm the mixture on a water-bath until the separated fatty acid forms a clear layer on the top of the aqueous fluid. Add 50 c.c. of Petroleum Benzin to the cooled liquid, stopper the test-glass and shake until solution of the fatty acid takes place, then allow 25 c.c. of this solution to evaporate at a gentle heat in a beaker and dry the residue until it is of constant weight at a temperature not exceeding 75° C. (167° F.). The residue should weigh at least 1 gramme, *P.G.*

Preparation.

LINIMENTUM SAPONIS. Liniment of Soap.

Soft Soap, 2 oz.; Camphor, 1 oz.; Oil of Rosemary, 3 fl. drm.; Alcohol (90 p.c.), 16 fl. oz.; Distilled Water, 4 fl. oz. Dissolve the Soap in the Water, and mix it with the Camphor and Rosemary dissolved in the Alcohol; after a week, filter.

Tests.—Soap Liniment has a sp. gr. of 0·895 to 0·900; it contains about 6 p.c. w/v of total solids and about 60 p.c. w/v of Absolute Alcohol.

Linimentum Saponis.—
U.S., Soap 60, Camphor 45, Oil of Rosemary 10, Alcohol 725, Water, *q.s.* to make 1000.

Linimentum Saponis Mollis.—U.S., Soft Soap 650, Oil of Lavender 20, Alcohol to make 1000.

Linimentum Saponis Rubefaciens.—Russ., Cantharides 1, Oil of Turpentine 20, Spanish Soap 24, Saponis Sebacei 16, Camphor 8, Alcohol (70 p.c.) 240, Solution of Caustic Ammonia 12.

Linimentum Saponis Camphoratum.—Swed., Linseed Oil 10, Solution of Caustic Potash 7, Camphor 5, Oil of Rosemary 1, Distilled Water 27, Alcohol (90 p.c.) *q.s.*

Linimentum Saponato-Camphoratum.—
Austr., Stearin 22, Solution of Caustic Soda 22, Glycerin 20, Alcohol (90 p.c.) 90; saponify and mix with it Camphor 20, Alcohol (90 p.c.) 790; add Ammonia 26, Lavender Oil 5, Oil of Rosemary 5.
Ger. and Jap., Sapo Medicatus 40, Camphor 10, Alcohol (90 p.c.) 420, Oil of Thyme 2, Oil of Rosemary 3, Liquid Ammonia 25.
Hung., Saponis Albissimi 120, Alcohol (70 p.c.) 500, Camphor 10, Oil of Lavender 5, Oil of Rosemary 5, Liquid Ammonia 20.

Linimentum Saponato-Camphoratum Liquidum.—Russ., Spirit of Soap 175, Spirit of Camphor 60, Solution of Caustic Ammonia 12, Oil of Thyme 1, Oil of Rosemary 2.

Linimento di Sapone con Canfora.—Ital., Curd Soap 10, Alcohol (90 p.c.) 125, Camphor 10, Oil of Rosemary 5, Liquid Ammonia 5.

Linimentum Opodeldoc.—
Norw., Saponis Butyracei 8, Camphor 2, Alcohol (90 p.c.) 84, Liquid Ammonia 4, Oil of Rosemary 1, Oil of Thyme 1.
Swed., Lard 10, Solution of Caustic Soda 6, Camphor 5, Oil of Rosemary 2, Oil of Thyme 1, Liquid Ammonia 10.

Balsamo Opodeldoch Liquido.—Span., Soda Soap 10, Camphor 9, Oil of Rosemary 2, Oil of Thyme 1, Liquid Ammonia 4, Alcohol (80 p.c.) 100.

Balsamo Opodeldoch Solido.—Span., Curd Soap 12, Camphor 10, Liquid Ammonia 4, Oil of Rosemary 2, Oil of Thyme 1, Alcohol (90 p.c.) 100.

Balsamum de Opodeldoc Concreto.—Mex., Sapo Animalis 30, Camphor 24, Liquid Ammonia 10, Oil of Rosemary 6, Oil of Thyme 2, Alcohol (90 p.c.) 250.

Baume Opodeldoch.—Fr., Sapo Animalis 19, Camphor 15, Alcohol (90 p.c.) 155, Liquid Ammonia 6, Oil of Rosemary 4, Oil of Thyme 1.

Opodeldoc.—
Dan., Saponis Medicati 80, Camphor 20, Alcohol (90 p.c.) 840, Oil of Thyme 4, Oil of Rosemary 6, Liquid Ammonia 50.
Port., Sapo Animalis 16, Camphor 16, Liquid Ammonia 8, Lavender Oil 1, Oil of Rosemary 1, Alcohol (85 p.c.) 158.
Swiss., Lard 10, Alcohol (90 p.c.) 5, Solution of Caustic Soda 5; saponify and add Alcohol (90 p.c.) 162, Camphor 5, Oil of Rosemary 2, Oil of Thyme 1, Liquid Ammonia 10.

Opodeldoc Liquidum.—
Swiss, Spirit of Soap 136, Spirit of Camphor 48, Liquid Ammonia 13, Oil of Rosemary 2, Oil of Thyme 1.

Spiritus Saponis.—
Austr., Olive Oil 100, Caustic Potash 60, Alcohol (90 p.c.) 100, Alcohol (68 p.c.) 738, Lavender Oil 2.
Belg., Saponis Officinalis 200, Alcohol (60 p.c.) 795, Lavender Oil 5.
Swiss, Olive Oil 100, Solution of Caustic Potash 52, Alcohol (90 p.c.) 500, Water 348.

Spiritus Saponatus.—

Dutch, Solution of Caustic Potash 75, Oil of Sesame 195, Alcohol (90 p.c.) 350, Water 378, Oil of Lavender 2.

Ger. and Jap., Olive Oil 6, Solution of Caustic Potash 7, Alcohol (90 p.c.) 30, Water 17.

Spiritus Saponato-Camphoratum.—

Dan., Caustic Potash 4, Distilled Water 67, Olive Oil 20, Alcohol (90 p.c.) 100, Camphor 5, Oil of Rosemary 2, Oil of Thyme 2.

Ger., Spirit of Camphor 60, Spirit of Soap 175, Liquid Ammonia 12, Oil of Thyme 1, Oil of Rosemary 2.

Tintura de Jabon Alcanforado.—Mex., Soap 12, Alcohol (80 p.c.) 400, Camphor 12, Oil of Rosemary 3, Oil of Thyme 3, Liquid Ammonia 12.

Not Official.

SAPO KALINUS VENALIS (*Ger.*).—A yellowish-brown, or greenish, translucent soap, prepared from Linseed Oil with Potash. For use in skin diseases.

SOLUTIO SAPONIS ÆTHEREA. *Syn.* Ether Soap.—Oleic Acid, 7 fl. oz.; Alcohol (90 p.c.), 3 fl. oz. Mix and neutralise with about 1½ fl. oz. saturated solution of Potassium Hydroxide (1 in 1 of Water); when cool add Oil of Lavender, 20 minims; Methylated Ether, sp. gr. 0·720, to 20 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

SPIRITUS SAPONIS KALINI (*Hebra*).—Soft Soap, 24; Alcohol (90 p.c.), 12; Spirit of Lavender, 1.

Potash Soap, 65; Spirit of Lavender, 3; Alcohol, *q.s.* to produce 100.—*B.P.C.*

Linseed Oil, 35; Solution of Caustic Potash, 20; Alcohol (68 p.c.) 44, Oil of Lavender, 1.—*Austr.*

MOLLIN.—A Soft Soap, containing 17 p.c. of uncombined fat and 30 p.c. of Glycerin.

It has been recommended as a basis for ointments.

Not Official.

SAPPAN.

The Heart-wood of *Cæsalpinia Sappan*, L., and a **Decoctum Sappan** (1 in 20), dose, ½ to 2 fl. oz. = 14·2 to 56·8 c.c., are official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

SARSÆ RADIX.

SARSAPARILLA.

Fr., Salsepareille du Mexique; Ger., Sarsepareille; Ital., Salsapariglia; Span., Zarzaparrilla.

The dried Root of *Smilax ornata*, Hook. f.

Several commercial varieties of the drug are known. The British Pharmacopœia have made the 'Jamaica Sarsaparilla,' imported from Costa Rica, official. The U.S. use *Smilax officinalis*, H. B. and K., *S. medica*, Schl. and Cham., *S. papyracea*, Duham., and other undetermined species of *Smilax*.

Medicinal Properties.—Alterative and tonic; opinions differ as to its efficacy. The Compound Decoction is given in secondary syphilis, chronic rheumatism and skin diseases, but generally in combination with other remedies such as Potassium Iodide.

Interest in this drug was revived by a lecture on some unusual manifestations of syphilis in the upper air passages (*B.M.J.* '06, i. 61), in the treatment of which a decoction of this root was recommended, 7 oz. of the stronger Zittmann's decoction being taken daily in the morning, and 7 oz. of the weaker decoction in the evening. The treatment was followed for 10 days by Kobert's decoction, and finally the two Zittmann's decoctions for another fortnight. Under the treatment the general health improved from day to day, the ulcers cicatrised in the most desirable manner, and ultimately were replaced by a solid scar.

Considerable discussion (*B.M.J.* '06, i. 359, 710, 770, 791, 889, 960, 1075) followed the appearance of this paper, and a reference is made to the English preparations and uses of Sarsaparilla.—*B.M.J.* '06, i. 710.

Incompatibles.—Alkalis; they accelerate its decomposition.

Official Preparations.—Extractum Sarsæ Liquidum, Liquor Sarsæ Compositus Concentratus.

Not Official.—Decoctum Sarsæ Compositum, Decoctum Zittmanni Fortius, Decoctum Zittmanni Mitius, Kobert's Decoction, Decoctum Sarsaparillæ Compositum, Syrupus Sarsaparillæ Compositus, and Tisane de Salsepareille.

Foreign Pharmacopœias.—Official in all.

Descriptive Notes.—There are several kinds of Sarsaparilla in commerce, the principal varieties being respectively known as Red Jamaica, Orange or native Jamaica, Lima, Honduras, Mexican and Guayaquil. The Red Jamaica kind is imported from Costa Rica and occurs in oblong bundles about $1\frac{1}{2}$ feet (45 cm.) long and 5 to 6 in. (12 to 15 cm.) in diameter, wrapped round with a few long roots. The roots are about $\frac{1}{8}$ in. (3 mm.) in diameter, usually furnished with many small rootlets, have a reddish-brown bark, and are longitudinally furrowed and wrinkled. This Sarsaparilla is usually preferred, as it gives more extract than the other kinds, but the Honduras kind, which is official in the *P.G.* and the *U.S.P.*, is more acrid, and has a mucilaginous taste. It is a brownish-grey, and the roots are about $\frac{1}{6}$ in. (4 mm.) thick. The bundles are cylindrical, about 24 in. (60 cm.) long and $3\frac{1}{2}$ in. (9 cm.) in diameter, or 27 in. (70 cm.) long and $2\frac{1}{2}$ in. (6 cm.) broad, closely wrapped round with a coil of the root. It is usually more starchy than the Jamaica kind. Native Jamaica Sarsaparilla is grown in that island, and is imported in limited quantity; it is chiefly consumed in the North of England. It is of a bright brown colour, plumper, $\frac{1}{6}$ in. (4 mm.) in diameter, and less shrivelled than the Red Jamaica kind.

Lima Sarsaparilla resembles the Red Jamaica kind, but is rather paler and occurs in cylindrical bundles about $2\frac{1}{2}$ in. (6 cm.) in diameter and 21 in. (50 cm.) long, with a few roots coiled round them, the rootlets being about $\frac{1}{8}$ in. (3 mm.) in diameter. Guayaquil Sarsaparilla occurs in loose bundles about 24 in. (60 cm.) long and 4 to 5 in. (10 to 12 cm.) wide, the roots being attached to the chump or rootstock; the roots are browner and coarser than the Jamaica kind, up to $\frac{1}{6}$ or $\frac{1}{5}$ in. (4 or 5 mm.) and less fibrous. The Mexican or Vera Cruz kind also is not packed in bundles, it contains the rootstock but the roots are slender, $\frac{1}{12}$ to $\frac{1}{10}$ in. (2 to 2·5 mm.) in diameter, and about 2 feet long, nearly straight and with few rootlets.

It is stated that the different kinds of Sarsaparilla can be distinguished in section by the character of the endodermis cells, but Vogl, *Pharmacognosie*, pp. 313–315 (and others), represent the cells of the Honduras Sarsaparilla as square and equally thickened, and those of Red Jamaica Sarsaparilla as radially rectangular and unequally thickened. The *B.P.* statement concerning the Jamaica Sarsaparilla, that the cells of the endodermis are uniformly thickened and nearly square in transverse section, has apparently been drawn from the Honduras variety.

The roots contain acicular crystals of Calcium Oxalate, and numerous starch grains, which are most abundant in the part farthest from the rhizome.

It may be noted that the *U.S.P.* attributes Honduras Sarsaparilla to *S. officinalis*, Kunth., and also makes official, *S. medica*, Cham. and Schlecht. (Mexican ?), *S. papyracea*, Duham. (Para ? Guatemala ?), *S. ornata*, Hook. f. (Jamaica ?); but it does not state the commercial equivalents of these species, and it is difficult to learn even from the 18th Ed. of the *National Dispensatory* which commercial varieties are intended. For illustrations of the different commercial kinds *see Pereira Mat. Med.*, vol. ii. fol. i. pp. 274–284 (4th Ed.).

Tests.—Sarsaparilla Root yields from 5 to 7 p.c. of ash.

Preparations.

EXTRACTUM SARSÆ LIQUIDUM. LIQUID EXTRACT OF SARSAPARILLA.

A Liquor obtained by repercolation of Sarsaparilla with Alcohol (20 p.c.), until 18 represents 20 of Root, then 2 of Glycerin is added. (1 root in 1)

Now made by repercolation with diluted Alcohol as suggested in the *Companion*, and Glycerin is used in place of Sugar.

Dose.—2 to 4 fl. drm. = 7·1 to 14·2 c.c.

Foreign Pharmacopœias.—Official in Belg., Fr., Mex. and U.S., 1 in 1. Fr., Ital., Mex., Port. and Span. have a **solid extract**,

Fluidextractum Sarsaparillæ Compositum.—Moisten Sarsaparilla in No. 30 powder 75, Glycyrrhiza in No. 30 powder 12, Sassafras in No. 30 powder 10, Mezereum in No. 30 powder 3, with 10 of Glycerin mixed with 90 of Alcohol (49 p.c.); percolate with Alcohol (49 p.c.). Reserve the first 80 parts and evaporate the remainder to a soft extract, which dissolve in reserved portion, and make up to 100 c.c. –*U.S.P.*

Tests.—Liquid Extract of Sarsaparilla has a sp. gr. of 1·050 to 1·090; it contains about 28 p.c. w/v of total solids and about 19 p.c. w/v of Absolute Alcohol.

LIQUOR SARSÆ COMPOSITUS CONCENTRATUS. CONCENTRATED COMPOUND SOLUTION OF SARSAPARILLA.

Sarsaparilla, cut transversely and bruised, 20; Sassafras Root, in shavings, 2; Guaiacum Wood, in shavings, 2; Dried Liquorice Root, bruised, 2; Mezereon Bark, cut small, 1; Alcohol (90 p.c.), 4½. Infuse the Sarsaparilla in 3 successive portions of 100 of Distilled Water, for 1 hour each, at 160° F. (71·1° C.). Boil the other solid ingredients with Distilled Water until exhausted. Rapidly concentrate the mixed infusion and decoction until, when cold, the liquid measures 16; add the Alcohol; set aside for at least 14 days; filter. The product should measure 20. (1 in 1)

Dose.—2 to 8 fl. drm. = 7·1 to 28·4 c.c.

This formula is practically the same as that which has been given in previous editions of the *Companion*, under the heading, 'Extractum Sarsæ Liquidum Compositum'; the ingredients are similar to those of Decoctum Sarsæ Compositum, *B.P.* '85.

Tests.—Concentrated Compound Solution of Sarsaparilla has a sp. gr. of 1·020 to 1·040; it contains from 10 to 15 p.c. w/v of total solids and about 20 p.c. w/v of Absolute Alcohol.

Not Official.

DECOCTUM SARSÆ COMPOSITUM.—Jamaica Sarsaparilla, cut transversely, 2½; Sassafras Root, in chips, ¼; Guaiacum Wood turnings, ¼; Dried Liquorice Root, bruised, ¼; Mezereon Bark, ⅛; Boiling Distilled Water, 30. Digest the solid ingredients in the Water for an hour, boil for 10 minutes, cool, strain and make up to 20 fl. oz.—*B.P.* 1885.

This has been incorporated in the *B.P.C.*

DECOCTUM ZITTMANNI FORTIUS. Zittmann's Decoction (Strong). —Sarsaparilla Root, 100; Water, 2600; Powdered Sugar, 6; Powdered Alum, 6; Mild Mercurous Chloride, 4; Red Mercuric Sulphide, 1; Anise Fruit, crushed, 4; Fennel Fruit, crushed, 4; Senna Leaves, cut, 24; Liquorice Root, cut, 12. The Sarsaparilla Root is digested for 24 hours with the Water, the powdered Sugar, powdered Alum, Mild Mercurous Chloride and Red Mercuric Sulphide are then added, the mixture heated in a covered vessel in a steam-bath for 3 hours, stirring frequently; the Anise Fruit, Fennel Fruit, Senna Leaves and the Liquorice Root are added towards the end of the boiling; the liquid strained by expression and set aside for a short time. Decant 2500 parts of the clear liquid.

DECOCTUM ZITTMANNI MITIUS. Zittmann's Decoction (Weak).—The residue from the stronger decoction, and Sarsaparilla Root, cut, 50; Water, 2600; Lemon Peel, cut and bruised, 3; Cassia Bark, crushed, 3; small Cardamom Seeds, bruised, 3; Liquorice Root, cut and bruised, 3. The residue of the stronger decoction and the Sarsaparilla Root are extracted with Water by heating in a steam-bath for 3 hours in a covered vessel, stirring frequently; the Lemon Peel, Cassia Bark, small Cardamoms and Liquorice Root are added towards the end of the operation; the liquid is strained by expression and set aside for a short time. Decant 2500 of the clear liquid.

KOBERT'S DECOCTION.—Sarsaparilla Root, in coarse powder, 1000; Water, *q.s.* Place the Sarsaparilla Root in a closed vessel with 4000 of Distilled Water, and set aside for 3 hours, occasionally stirring; heat and keep boiling for 1 hour, then press out. Repeat this once. Evaporate the combined decoctions until there remains 1 litre (quart), mix well with an equal volume of Alcohol (90 p.c.), wash out the residue with boiling Alcohol (90 p.c.) ½ litre, strain through flannel and filter, evaporate to ½ litre or less; establish the quantity of Parillin and Sarsasaponin according to the method of V. Schulz-Christophson, and adjust the strength of the finished product either by evaporating or by adding Distilled Water, so that it shall contain 2 p.c. of the above Glucosides.

DECOCTUM SARSAPARILLÆ COMPOSITUM.—Mix Sarsaparilla 20 with Water 520, and let the mixture stand for 24 hours at a temperature of 35° to 40° C.; after the addition of Sugar 1, Potash Alum 1, heat in a covered vessel, stirring frequently, for 3 hours in a water-bath. Add Anise 1, Fennel 1, Senna 5, Glycyrrhiza 2, leave in the water-bath for a quarter of an hour and separate the liquid by pressing. After the pouring-off bring the weight of the decoction to 500 by the addition of Water.—*Ger.*

TISANE DE SALSEPAREILLE.—Macerate 50 grammes of Sarsaparilla (split and cut) in a little more than 1000 c.c. of Water for 2 hours, place it on the fire, and, as soon as it commences to boil, take it off again and let it digest for two hours; allow it to deposit and decant so as to obtain 1000 c.c. of Tisane. —*Fr.*

SYRUPUS SARSAPARILLÆ COMPOSITUS.—Fluid Extract of Sarsaparilla 2000, Fluid Extract of Glycyrrhiza 150, Fluid Extract of Senna 150, Sugar 6500, Oil of Sassafras 2, Oil of Anise 2, Oil of Gaultheria 2, Water *q.s.* to make 10,000. —*U.S.*

Fluid Extract of Sarsaparilla 15, Fluid Extract of Glycyrrhiza 1, Fluid Extract of Senna 3, Spirit of Anise 1, Simple Syrup 80.—*Belg.*

Percolate Sarsaparilla 100, Guaiacum Wood 20, Senna Leaves 15, Sassafras 5, Anise 10, with a mixture of Alcohol (90 p.c.) and Water (equal weights) until 600 is obtained; to 300 add 50 of Glycerin, filter and continue the evaporation to 100; to each 10 of this extract add 90 of Syrup.—*Swiss.*

SIROP DE SALSEPAREILLE COMPOSÉ.—Pour on to 1000 of Sarsaparilla (split and cut) sufficient Water at 80° C. to cover it, digest for 6 hours and separate the liquid; make a second digestion in a similar manner and add the liquid to that of the first; also a third, which you put aside; heat this to ebullition and throw in 60 of dried Borage flowers, 60 of dried petals of Roses, 60 of Senna leaves, and 60 of Anise fruits, allow to infuse for 6 hours and press; evaporate the first liquors, and when they are reduced to 500 grammes add the third liquid and continue the evaporation until the product weighs 2000 grammes, clarify with white of egg and strain through a cloth; add to the liquid thus obtained 1000 of Sugar and 1000 of White Honey, and make a syrup by boiling and clarification until it has a sp. gr. of 1·29.—*Fr.*

SASSAFRAS RADIX.

SASSAFRAS ROOT.

The dried Root of *Sassafras officinale*, T. Nees and Eberm.

It contains a yellowish, or reddish-yellow, volatile Oil **(Oil of Sassafras)**, which is largely distilled in America, and is official in U.S.; the yield is about 2 p.c. The bulk of this Oil consists of **Safrol**, $C_{10}H_{10}O_2$, a compound also extracted from Oil of Camphor. It is much used for scenting soaps.

Medicinal Properties.—Aromatic and carminative. Used as an adjuvant to other medicines.

The oil strongly recommended for pediculi; the brush is dipped in a saucer full of the oil, the whole head well brushed with it, and a close-fitting linen cap put on for 24 hours.—*B.M.J.* '07, ii. 64.

Official Preparation.—Contained in Liquor Sarsæ Compositus Concentratus.

Foreign Pharmacopœias.—Official in Austr., Mex. and Port., the **Root**; Ger., Jap., Span., Swiss and U.S., the **Root-bark.**

Descriptive Notes.—The root met with in commerce is usually offered by the wholesale houses in the form of chips, apparently of large roots, since very little bark is present. The bark is rough, brown, with a whitish external layer, but smooth, with a satiny lustre on the inner surface. It is slightly astringent, and has a Safrol flavour. The chips of wood are greyish, with a yellowish or often with a reddish tinge. In the *U.S.P.* the much more aromatic bark, deprived of the periderm, is official, as well as the pith of the stem (Sassafras Medulla) *see* below.

The bark is characterised by large oil cells, pitted parenchymatous cells, thick-walled bast fibres, and starch grains singly or in groups of 2 to 3 each, with a well-marked hilum. The starch also occurs in the wood and in the medullary rays. The bark contains a dark brown colouring matter soluble in Liquor Potassæ.

Tests.—Sassafras Root yields about 2 p.c. of ash.

SASSAFRAS MEDULLA. Sassafras Pith (*U.S.*).—It abounds in a gummy matter, which forms a mucilage with Water. 60 grains of Pith to 20 fl. oz. is used as a soothing application to the eyes, and as a drink in diarrhœa.

OLIVERI CORTEX. *Syn.* BLACK SASSAFRAS.—The dried Bark of *Cinnamomum Oliveri* is official in the *Ind.* and *Col. Add.* for the Australian Colonies. Also **Tinctura Oliveri Corticis,** 1 in 10 (Alcohol 60 p.c.); **dose,** 30 to 60 minims = 1·8 to 3·6 c.c.

SCAMMONIÆ RADIX.

SCAMMONY ROOT.

The dried brownish, or yellowish-grey, perennial tapering Root of *Convolvulus Scammonia*, L.

From Syria and Asia Minor.

Official Preparation.—Used in the preparation of Scammoniæ Resina.

Official in Span. and Swiss.

Descriptive Notes.—The root occurs in commerce in stout hard, cylindrical pieces, often spirally twisted, and having a rough, furrowed, greyish-brown bark, and it is often 2 to 3 in. (50 to 75 mm.) in diameter. Internally it is greyish-yellow and fibrous, and in transverse section exhibits irregularly arranged circles of woody bundles. In the cortical region and around these circles dark resin cells are frequent, and the softer tissues are full of a muller-shaped starch, which is characteristic. The root has been scarce during late years, its exportation having been prohibited, and a root known in commerce as 'Mexican Scammony' Root, derived from *Ipomœa Orizabensis*, Leden., has taken its place as a cheap substitute for the manufacture of Scammony Resin, with which its resin appears to agree in chemical characters. It occurs in irregularly oblong segments, evidently derived from a large root, and like Scammony Root has projecting fibres, but differs in its radiate structure. It contains about 15½ to 18½ p.c. of resin against 5½ to 8½ p.c. in true Scammony Root. *See P.J.* (4) xviii. pp. 326, 327.

Tests.—Scammony Root yields about 10 p.c. of ash. It is officially stated to yield a resin possessing the properties of Scammony Resin when treated with Alcohol (90 p.c.), but no indication as to the amount expected to be yielded is given. It yields about 9, if it is of Levantine origin, the average yield being about 8 p.c. As the root is used only for preparing the Resin it is considered that probably no standard need be indicated, consideration should, however, be given to the different varieties of Scammony Resin now being obtained from roots of the so-called Mexican Scammony.

SCAMMONIÆ RESINA.

SCAMMONY RESIN.

Greenish-grey, or brownish-green, translucent, brittle lumps, with more or less sharp edges, and breaking with a shining fracture. It has a peculiar, characteristic odour.

Scammony Resin is official in the *B.P.* and the *U.S.P.*, but not in the *P.G.* It is identical with the Ether-soluble Resin of Jalap.

It is prepared by exhausting Scammony Root with Alcohol (90 p.c.) recovering the greater part of the Alcohol, and pouring the concentrated liquid into Distilled Water, which precipitates the Resin.

Solubility.—It is soluble in almost all proportions of Alcohol (90 p.c.) or Ether; also soluble in Solution of Potassium Hydroxide.

The purified Resin is known in this country as **Scammonin,** *see* p. 705.

Medicinal Properties.—An energetic, hydragogue cathartic. May be used when brisk action is needed, as in cerebral congestion and severe dropsy; but on account of its griping properties it is rarely used alone. In combination it promotes the action of other medicines, whilst its own harshness is mitigated. It acts also as an anthelmintic, to round-worms and tapeworms.

Dose.—3 to 8 grains = 0·2 to 0·52 gramme.

Official Preparations.—Pilula Scammonii Composita and Pulvis Scammonii Compositus. Contained in Extractum Colocynthidis Compositum, Pilula Colocynthidis Composita, and Pilula Colocynthidis et Hyoscyami.

Not Official.—Confectio Scammonii, Mistura Scammonii, Pulvis Scammonii cum Hydrargyro.

Foreign Pharmacopœias.—Official in Belg., Fr., Ital., Mex., Norw. and U.S.

Tests.—Over and above the official description of the Resin the *B.P.* does not give any chemical tests or constants by which Scammony Resin may be distinguished. The Acid, Ester and Saponification values afford a means of distinguishing the Resin. The Acid value should be, according to Kremel, 14·6, the Ester value 171·0 and the Saponification value 185·6. It may be distinguished from Guaiacum Resin by the non-production of a blue coloration when Ferric Chloride T.S. is added to its solution in Absolute Alcohol, and by the non-formation of a blue colour on the addition of Hydrogen Peroxide Solution to its solution in Absolute Alcohol. It may be distinguished from Jalap Resin by the fact that it dissolves almost entirely in Ether. It should yield when incinerated with free access of air not more than 1 p.c. of ash, which is also the limit allowed by the *U.S.P.* The *B.P.* gives no figure for the ash limit. Resin, if present, may be detected by the increase in the Acid value and the decrease in the Ester value.

Preparations.

PILULA SCAMMONII COMPOSITA. COMPOUND SCAMMONY PILL.

Scammony Resin, 1; Jalap Resin, 1; Curd Soap, in powder, 1; Tincture of Ginger, 3; dissolve, and evaporate to pill consistence.

Dose.—4 to 8 grains = 0·26 to 0·52 gramme.

PULVIS SCAMMONII COMPOSITUS. Compound Powder of Scammony.

Scammony Resin, 4; Jalap, 3; Ginger, 1. (1 in 2)

Dose.—10 to 20 grains = 0·65 to 1·3 grammes.

Not Official.

CONFECTIO SCAMMONII.—Resin of Scammony, in powder, 6; Ginger, 3; Oil of Caraway, ¼; Oil of Cloves, ⅛; Syrup, 6; Clarified Honey, 3. Rub the powder with the Syrup and Honey, then add the Oils, and mix. **Dose.**—10 to 30 grains.—*B.P.* 1885.

This has been incorporated in the *B.P.C.*

MISTURA SCAMMONII.—Scammony, in powder, 6 grains; Milk, 2 fl. oz.—*B.P.* 1885.

This has been incorporated in the *B.P.C.*

PULVIS SCAMMONII CUM HYDRARGYRO.—Mercurous Chloride, 1; Scammony Resin, in powder, 4.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

Tabellæ Scammoniæ cum Chocolata official in Belg., about 3 grains in each.

SCAMMONIUM.

SCAMMONY.

Brown, dark grey, or brownish-black, irregular masses, or circular cakes, breaking with a glossy, resinous fracture. It possesses a peculiar, cheese-like odour.

It is officially described as a Gum-resin, obtained by incision from the living Root of *Convolvulus Scammonia*, L., known in commerce as Virgin Scammony.

Chiefly from Smyrna, in Asia Minor.

Solubility.—Almost entirely dissolved in boiling diluted Alcohol.

Medicinal Properties.—Similar to those of Scammony Resin, but Scammony emulsifies with Water, the Resin does not.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Foreign Pharmacopœias.—Official in Fr., Mex., Port., Span. and U.S.

Descriptive Notes.—Scammony Resin is usually imported in boxes containing pieces varying in purity, which are sorted in this country, the purest pieces being sold as Virgin Scammony. The finest pieces are brittle, translucent, have a brownish tint, a resinous fracture, and are more or less covered with a greyish powder; other pieces have a blackish resinous fracture, are less brittle, and sometimes more or less porous, due to fermentation after collection. An inferior kind, adulterated with Flour and Chalk, known as Skilip Scammony, is hard, tough, not easily fractured, and has an opaque, greyish fracture; it contains only about 40 p.c. of Resin. When rubbed with a wetted finger Scammony gives a milky emulsion, which Resin of Scammony does not. Formerly, Aleppo Scammony was purer than that of Smyrna, now the reverse is the case.

Tests.—Scammony is readily friable and forms with Water a greenish emulsion. When treated with Ether at least 70 p.c. of Resin is officially required to be dissolved. In estimating the Resin soluble in Ether it is recommended to use a light Ether, sp. gr. 0·717, and to break up the residue after evaporating the Ether and again heat, in order to avoid error due to the Resin holding down the Ether. It would probably be better to dry the Scammony, extract with Ether and weigh the insoluble residue. The *U.S.P.* requires that not less than 75 p.c. should be soluble in Ether, and this was the standard previously adopted in the *B.P.* 1885. It may be noted that the majority of good commercial samples of the Gum Resin yield a larger percentage of Ether-soluble Resin than the present official limit. The *U.S.P.* adds that the residue remaining after the evaporation of the ethereal solution when dissolved in hot Potassium or Sodium Hydroxide Solution is not reprecipitated on acidification with Diluted Sulphuric Acid. Aleppo Scammonium has an Acid value of 8·2, an Ester value of 172·0 and a Saponification value of 180·2 (Dieterich, *Analysis of Resins, Balsams and Gum Resins*). It is generally heavily adulterated, Resin, Starch, Chalk and other mineral substances being added. Resin, if present, may be detected by the increase in the Acid value and the decrease in the Ester value. A portion of the powdered Gum Resin when boiled with Water and cooled should give no decided blue coloration on the addition of Iodine Solution. The greenish emulsion formed on triturating the powdered Gum Resin with Water should not effervesce on the addition of Diluted Hydrochloric Acid. It should leave when ignited with free access of air not more than 3 p.c. of ash which is the official limit; the *U.S.P.* also places the ash limit at this figure. It may be distinguished from Guaiacum Resin by not affording a blue coloration on the addition of Ferric Chloride T.S. to its alcoholic solution.

SCILLA.

SQUILL.

FR., SCILLE; GER., MEERZWIEBEL; ITAL., SCILLA; SPAN., ESCILA.

The Bulb of *Urginea Scilla*, Steinh., divested of its dry membranous outer scale, cut into slices, and dried.

From the Mediterranean coasts.

Two active principles have been extracted from Squill, **Scillitoxin** (Scillain) and **Scillipicrin**, both of which strongly affect the heart; but their actions are antagonistic.

Under the title of **Urginea**, *syn.* Indian Squill, the younger bulbs of *Urginea Indica*, Kunth., also the younger bulbs of *Scilla Indica*, J. J. Baker, are official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Medicinal Properties.—A stimulant expectorant, diuretic and cardiac tonic, acting similarly to Digitalis, but is more irritating to the gastro-intestinal mucous membrane. It increases the secretion of the bronchial mucous membrane and aids the expectoration of mucus. In chronic bronchitis with scanty secretion it is used with other expectorants, such as Ipecacuanha and Ammonia. In acute bronchitis it is too irritating to the bronchial mucous membrane, while in phthisis it may produce dyspepsia. In dropsy, especially if cardiac in origin, it is combined with Blue Pill and Digitalis.

Dose.—1 to 3 grains = 0·065 to 0·2 gramme.

Official Preparations.—Acetum Scillæ, Oxymel Scillæ, Pilula Scillæ Composita, and Tinctura Scillæ. Contained in Pilula Ipecacuanhæ cum Scilla. The **Vinegar** is used in the preparation of Syrupus Scillæ.

Not Official.—Syrupus Scillæ Compositus, Fluidextractum Scillæ, Mistura Scillæ Composita, Mistura Scillæ et Ipecacuanhæ, Linctus Scillæ, Linctus Scillæ Opiatus, Dr. Abercombie's Cough Mixture, Dr. Milner Fothergill's Mixture.

Foreign Pharmacopœias.—Official in all the Foreign Pharmacopœias; Fr. (Scille); Mex. and Span. (Escila). Belg. and Fr. have Extractum Scillæ, and U.S. has Fluidextractum Scillæ.

Descriptive Notes.—The Squill bulbs, which are often 6 in. (15 cm.) in diameter, are offered in commerce in the form of small curved dried strips about 1 to 5 cm. long, and $\frac{3}{8}$ to $\frac{5}{8}$ in. (9 to 15 mm.) broad in the middle, tapering to either end, usually of a yellowish-white colour, tough and slightly flexible, but brittle when quite recently dried. It has no odour, but a disagreeable bitter taste. There are two varieties of the bulb, known respectively as the Red and White Squill. When derived from the Red Squill the strips have a pinkish colour. Occasionally an unusually bitter sample is met with, but the cause of this has not been ascertained. Squills are very hygroscopic, and to keep their medicinal activity unimpaired should be thoroughly dried on arrival, and kept in an air-tight vessel. The powder is best kept in a bottle with a hollow stopper containing quicklime, or it readily cakes into a hard mass. The bulbs are collected in August, and when fresh their handling causes considerable irritation to the skin. Squill is characterised by the presence of long prismatic crystals of Calcium Oxalate, often 1 mm. long, immersed in a mucilage which contracts into a jelly on the addition of Alcohol. Acicular raphides are also present. Large stomata also occur, and small bundles of laticiferous vessels. Starch granules in small quantity are present in elongated cells near the vascular bundles.

Tests.—Squill yields from 2 to 3 p.c. of ash, and 4 p.c. should not be exceeded. Determinations of the ash made in the author's laboratory showed an average of 2·4 p.c. A standard of 20 p.c. has been suggested for the amount of moisture.

Preparations.

ACETUM SCILLÆ. Vinegar of Squill.

$2\frac{1}{2}$ of Squill, bruised, macerated with Diluted Acetic Acid, *q.s.* to yield 20. (1 in 8)

It is conveniently filtered through Talc.

Dose.—10 to 30 minims = 0·6 to 1·8 c.c.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Mex. Norw., Port., Swiss and U.S., 1 in 10. All by weight except U.S.

Tests.—Vinegar of Squill has a sp. gr. of 1·035 to 1·040; it contains from 5 to 9 p.c. w/v of total solids and about 4·0 p.c. w/v of absolute Acetic Acid, as determined by titrating a measured quantity (10 c.c.) with Normal Volumetric Sodium Hydroxide Solution; 10 c.c. requiring from 6 to 7 c.c.

Although a standard of 9 p.c. w/v of total solids is sometimes reached, it appears (*C.D.* '02, i. 733, 808) that a fair average is 8 p.c., with 7 to 9 p.c. as the limit, the figures occasionally going outside by a fraction. When prepared strictly in accordance with the *B.P.* directions it contains immediately when made 3·6 to 4·0 p.c. of absolute Acetic Acid. The *German Pharmacopœia* allows for a loss of Acetic Acid in the process, as the menstruum prescribed contains 5·4 p.c. w/w of Acetic Acid, but the titration test of that Pharmacopœia requires 4·8 to 5·1 p.c. w/v of the acid in the finished Vinegar.

A corresponding preparation, **Acetum Urgineæ**, is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

OXYMEL SCILLÆ. OXYMEL OF SQUILL.

Squill, bruised, 2½; Acetic Acid, 2½; Distilled Water, 8; Clarified Honey, liquefied, *q.s.* to bring the fluid to sp. gr. 1·320. (about 1 in 15)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

A corresponding preparation, **Oxymel Urgineæ**, is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Foreign Pharmacopœias.—Official in Austr., Extract of Squill 1, Acetic Acid (96 p.c.) 1, Refined Honey 98; Dan. and Norw., Vinegar of Squill 35, Honey to make 100; Dutch, Vinegar of Squill 2, Refined Honey 1, Sugar 1; Ger. Ital., Jap. and Span., Vinegar of Squill, 1 Refined Honey 2; Hung., Refined Honey 320, Extract of Squill 2, Acetic Acid (96 p.c.) 3, Diluted Acetic Acid 4; Port., Mex. and Fr., Vinegar of Squill 1, Honey 4; Swed., Squill 1, Acetic Acid 2, Distilled Water 8, Refined Honey 30; Swiss, Vinegar of Squill 3, Sugar 3, Refined Honey 4. Not in Belg., Russ. or U.S.

Tests.—Oxymel of Squill should have a sp. gr. of about 1·320.

PILULA SCILLÆ COMPOSITA. COMPOUND SQUILL PILL.

Squill, 1¼; Ginger, 1; Ammoniacum, 1; Hard Soap, 1; Syrup of Glucose (by weight), about 1. (about 1 in 4)

Dose.—4 to 8 grains = 0·26 to 0·52 gramme.

A corresponding preparation, **Pilula Urgineæ Composita**, is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

SYRUPUS SCILLÆ. SYRUP OF SQUILL.

Vinegar of Squill, 20; Refined Sugar, 38; it should yield 58 by weight. (about 1 of Squill in 18)

Quantity of Sugar reduced from 40 to 38.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Official in U.S., Vinegar of Squill 45, Sugar 80; Water to measure 100.

Syrupus Scillæ Compositus.—Fluid Extract of Squill, 8; Fluid Extract of Senega, 8; Antimony and Potassium Tartrate, 0·2; Purified Talc, 2; Sugar, 75; Water, *q.s.* to make 100. Average Dose.—2 c.c. (30 minims).—*U.S.P.*

A corresponding preparation, **Syrupus Urgineæ**, is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Tests.—Syrup of Squill has a sp. gr. of about 1·345.

TINCTURA SCILLÆ. TINCTURE OF SQUILL.

1 of Squill, bruised, macerated with 5 of Alcohol (60 p.c.). (1 in 5)

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Foreign Pharmacopœias.—Official in Belg., Fr., Ger., Ital., Jap., Mex., Port., Span. and Swiss, 1 in 5; all by weight; U.S., 1 in 10. Fr. has also Vin de Scille Composé.

A corresponding preparation, **Tinctura Urgineæ**, is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Tests.—Tincture of Squill has a sp. gr. of 0·960 to 0·975; it contains about 12 p.c. w/v of total solids and about 54 p.c. w/v of Absolute Alcohol. A standard of 10 p.c. w/v or more has been suggested for the total solids.

Not Official.

FLUIDEXTRACTUM SCILLÆ.—Squill, in No. 20 powder, 100; Acetic Acid and Water *q.s.* Mix 27·5 of Acetic Acid with 72·5 of Water and macerate the powder in 80 of the mixture for 48 hours, transfer to a percolator and by slow percolation with the same menstruum continue until the product measures 100.—*U.S.P.* Average Dose.—1½ minims (0·1 c.c.).

This is an Acetic Acid extract.

The previous edition *U.S.P.* 1890 was prepared by exhausting 100 of Squill with Alcohol (70 p.c.), reserving the first 75 and evaporating the weaker percolates to an extract, which was dissolved in the reserved portion, and the product made up to 100. The *B.P.C.* have included an Extractum Scillæ Liquidum made in a similar manner to this (*U.S.P.* 1890) with Alcohol (70 p.c.). It has been proposed by Greenish (*P.J.* '07, ii. 99) to make Acetum Scillæ, Oxymel Scillæ, Syrupus Scillæ, with this fluid extract, but in that case the solvent action of the Acetic Acid would be lost. The *U.S.P.* have now discarded this fluid extract for one made with Acetic Acid as given above.

MISTURA SCILLÆ COMPOSITA.—Oxymel of Squill, 40 minims; Compound Tincture of Camphor, 20 minims; Spirit of Nitrous Ether, 20 minims; Water, to 1 fl. oz.—*East London.*

This has been incorporated in the *B.P.C.*

MISTURA SCILLÆ ET IPECACUANHÆ.—Vinegar of Squill, 10 minims; Vinegar of Ipecacuanha, 10 minims; Potassium Citrate, 15 grains; Solution of Ammonium Acetate, 2 fl. drm.; Anise Water, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

LINCTUS.—Oxymel of Squill, 15 minims; Mucilage of Tragacanth, 15 minims; Glycerin, 15 minims; Emulsion of Chloroform, 3 minims; Syrup, to 1 fl. drm.—*St. Thomas's.*

This has been incorporated in the *B.P.C.* under the title **Linctus Scillæ**, *syn.* Linctus; Simple Linctus.

LINCTUS SCILLÆ OPIATUS.—Compound Tincture of Camphor, Oxymel of Squill, Syrup of Tolu, of each equal parts. **Dose.**—One teaspoonful.—*St. Bartholomew's.*

This has been incorporated in the *B.P.C.* under the title **Linctus Scillæ Compositus** (or Opiatus).

DR. ABERCOMBIE'S COUGH MIXTURE.—Tincture of Opium, 160 minims; Syrup of Squill, 2 fl. oz.; Cinnamon Water, 4 fl. oz.; Water, 4 fl. oz. One tablespoonful for a dose.—*Pharm. Form.*

This has been incorporated in the *B.P.C.* under the title **Mistura Scillæ et Opii**, *syn.* Abercombie's Cough Mixture.

DR. MILNER FOTHERGILL'S MIXTURE.—Syrup of Squill, 1; Dilute Hydrobromic Acid, $\frac{1}{2}$; Spirit of Chloroform, $\frac{1}{2}$; Water, to 8. **Dose.**—$\frac{1}{2}$ oz. 3 times a day, to be sipped slowly.—*Pharm. Form.*

This has been incorporated in the *B.P.C.* under the title **Mistura Scillæ** with the synonym, Fothergill's Cough Mixture, but with Water to 10 instead of to 8.

SCOPARII CACUMINA.

BROOM TOPS.

The fresh and the dried Tops of *Cytisus scoparius*, Link., a woody shrub indigenous to England, and also found throughout the greater part of Europe.

Medicinal Properties.—Diuretic and in large doses cathartic. Employed in dropsical complaints, especially if cardiac, and often prescribed along with Potassium salts and Digitalis; in renal dropsy it is contra-indicated if there be acute nephritis.

Official Preparations.—Infusum Scoparii and Succus Scoparii.

Not Official.—Decoctum Scoparii, Infusum Scoparii Concentratum, Sparteina, Sparteinæ Periodidum, Sparteinæ Sulphas.

Foreign Pharmacopœias.—Official in U.S. (dried tops).

Descriptive Notes.—Both the fresh and dried tops are official, the former for the succus and the latter for the infusion. The wiry dark green stem and branches are 5-angled, hairy on the young twigs (glabrous, *B.P.*), flexible, and $\frac{1}{12}$ to $\frac{1}{8}$ in. (2 to 3 mm.) thick. The branches are set at an acute angle to the stem, and in the upper part have simple and nearly sessile leaves, but in the lower part trifoliate leaves, which are obovate and are furnished with a petiole about their own length. The fresh plant, when bruised, has a characteristic odour, which is lost in drying. It has a faintly bitter taste. The younger parts of the plant are hairy as well as the young leaves, and the young branches are pubescent before the plant flowers, but in the dried drug (probably collected after the fruit is formed) the pubescence of the stem and the hairs of the leaves are not usually visible, and the *B.P.* description evidently applies to the plant collected in summer or early autumn.

Tests.—Broom Tops yield about 3 p.c. of ash.

Preparations.

INFUSUM SCOPARII. Infusion of Broom.

Broom Tops, dried and bruised, 2; boiling Distilled Water, 20; infuse 15 minutes, and then strain. (1 in 10)

Dose.—1 to 2 fl. oz. = 28·4 to 56·8 c.c.

It takes the place of Decoction of Broom, *B.P.* '85.

SUCCUS SCOPARII. Juice of Broom.

To 3 of Juice from bruised Fresh Broom Tops, add 1 of Alcohol (90 p.c.); after 7 days filter.

Dose.—1 to 2 fl. drm. = 3·6 to 7·1 c.c.

Not Official.

DECOCTUM SCOPARII.—Broom Tops, dried, 1; Distilled Water, *q.s.* to make the final product after boiling for 10 minutes measure 20 fl. oz.—*B.P.* 1885.

This has been incorporated in the *B.P.C.*

INFUSUM SCOPARII CONCENTRATUM.—Broom Tops, in No. 20 powder, 80; Alcohol (90 p.c.), 25; Dilute Chloroform Water (1 in 1000), *q.s.* to make 100. Prepare by repercolation. Before the addition of the Alcohol to the reserved portion this should be heated to a temperature of not less than 85° C. and maintained thereat for 5 minutes. Dose.—1 to 2 fl. drm. = 3·6 to 7·1.—*Farr* and *Wright*, *P.J.* '06, i. 165 and '07, i. 621; *C.D.* '06, i. 252; and *Y.B.P.* 1907, 248.

This appears in the *B.P.C.*

SPARTEINA ($C_{15}H_{26}N_2$, eq. 232·53).—A clear, colourless, oily liquid, heavier than Water, having an odour somewhat resembling Aniline, and an intensely bitter taste. It is a liquid alkaloid, obtained from Broom.

It should be kept in well-stoppered glass bottles of a dark amber tint, and protected as far as possible from exposure to light and air, as it tends to darken in colour and to become thick.

Practically insoluble in Water, soluble in Alcohol, in Ether, and in Chloroform.

Foreign Pharmacopœias.—Official in Mex. and Span.

Tests.—Sparteine boils at about 287° C. (548·6° F.). It dissolves in Alcohol (90 p.c.), the solution being lævogyrate. It possesses a strongly alkaline reaction towards the usual indicators of neutrality. A glass rod moistened with Hydrochloric Acid held over a watch-glass containing a drop of Sparteine evolves white fumes. It unites with acids to form crystallisable salts. On gradually adding a solution containing 3 parts of Iodine dissolved in Ether to an ethereal solution of 1 part of Sparteine, a black precipitate is formed, which when separated, washed with Ether and dissolved in boiling Alcohol crystallises on cooling in beautiful green needles. A solution of Sparteine gives with Cadmium Iodide Solution a white curdy precipitate, with Sodium Phospho-molybdate Solution a white precipitate, redissolving on heating the liquid. Platinum Chloride Solution yields a yellow crystalline precipitate very insoluble in cold Water and Alcohol, but crystallising from Hydrochloric Acid in rhombic prisms. It yields no coloration with Sulphuric or Nitric Acid. It may be quantitatively determined by titration with Normal Volumetric Sulphuric Acid Solution, using Iodeosin Solution as an indicator of neutrality. In a purely aqueous titration 1 c.c. of Normal Volumetric Sulphuric Acid Solution represents 0·11626 gramme of pure Sparteine. In strong alcoholic solution (provided the Water introduced is not sufficient to unduly reduce the alcoholic strength), 1 c.c. of the Normal Acid Solution represents 0·23253 gramme of pure Sparteine. It should leave no weighable residue when heated with free access of air.

SPARTEINÆ PERIODIDUM ($C_{15}H_{26}N_2.2HI.I_3$. eq. 864·03). — Small, bronze-green crystals, or bronze-green amorphous powder. Insoluble in Water, soluble in Alcohol (90 p.c.). Diuretic. Prepared by the author for the late Dr. Mortimer Granville, and forming one of the series of alkaloidal periodides which evolve Iodine slowly, and which were used by him in gout.

Dose.—½ to 4 grains = 0·032 to 0·26 gramme.

Tests.—Sparteine Periodide dissolves in Alcohol (90 p.c.). 1 gramme when dissolved in 10 c.c. of Alcohol (90 p.c.) and titrated with Tenth-normal Volumetric Sodium Thiosulphate Solution requires about 33·0 c.c. to discharge the colour produced on the addition of Starch Mucilage. This indicates about 41·5 p.c. of Iodine. When treated with Sodium Thiosulphate Solution and made alkaline with Ammonia, shaken with Ether and the ethereal solution spontaneously evaporated, the separated alkaloid should answer the tests given under Sparteine. When ignited with free access of air it should leave no weighable residue.

SPARTEINÆ SULPHAS ($C_{15}H_{26}N_2.H_2SO_4.5H_2O$, eq. 419·27).—Colourless, prismatic crystals, or a white, crystalline powder.

The number of molecules of Water of crystallisation varies with the solution from which it is crystallised. The *U.S.P.* states that when recrystallised from a solution in Alcohol (48·9 p.c.) it contains 5 molecules of Water of crystallisation. The salt official in the *Fr. Codex* (1908), as well as that official in the present *U.S.P.*, contains 5 molecules of Water of crystallisation; that official in the 1890 edition of the *U.S.P.* contained 4 molecules of Water of crystallisation.

It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from the light.

Soluble 2 in 1 of Water, 1 in 5 of Alcohol (90 p.c.).

Medicinal Properties.—Cardiac tonic and diuretic. Useful in mitral disease. It slows and strengthens the pulse. Its action is more rapid and less persistent than that of Digitalis.—*B.M.J.* '86, i. 1246; '88, i. 363; *L.* '87, ii. 203; *P.J.* (3) xvi. 543; *Pr.* li. 213; as a preliminary to chloroform anæsthesia.—*B.M.J.E.* '94, ii. 48; *T.G.* '95, 40.

Dose.—¼ to 2 grains = 0·016 to 4·13 gramme.

Foreign Pharmacopœias.—Official in Fr., Mex., Span., Swiss and U.S.

Tests.—Sparteine Sulphate when heated to a temperature of 110° C. (230° F.) loses its Water of crystallisation, equivalent to 21·3 p.c. The anhydrous salt melts at 136° to 138° C. (276·8° to 280·4° F.); the *Fr. Codex* gives 145° C. (293° F.). It dissolves readily in Water, forming a clear solution possessing an acid reaction towards blue Litmus paper. When rendered alkaline with Ammonia, shaken with Ether and the ethereal solution evaporated spontaneously, the separated alkaloid answers the tests given under Sparteine. A 5 p.c. aqueous solution affords a yellow precipitate with Potassium Ferrocyanide Solution. A small quantity of the salt mixed in a porcelain capsule with one-third of its weight of Chromic Acid, and gently warmed gives a green coloration and simultaneously emits a distinct odour of Coniine. An aqueous solution of the salt affords with Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid. The percentage of Sparteine Sulphate present may be determined by direct titration with Tenth-normal Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator. The choice of a solvent in performing the process of titration is important, as although Sparteine is di-basic only half the acid is indicated by titration under the above conditions in aqueous solutions, but when Sparteine Sulphate is dissolved in Alcohol (Absolute or 90 p.c.) the full quantity of acid is indicated. When dissolved in Water 1 c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution is equivalent to 0·041927 gramme of crystallised Sparteine Sulphate, but with Absolute Alcohol or Alcohol (90 p.c.) as a solvent, each c.c. of the Tenth-normal volumetric alkali solution corresponds to 0·02096 gramme of the pure crystallised salt. It should be free from readily charred organic impurities, and should not contain Aniline Sulphate, Ammonium salts, or mineral matter. The salt itself and its solution in concentrated Sulphuric Acid should be colourless. It should yield no odour of Isophenylcyanide when 1 dgm. is heated with 5 drops of Chloroform and 1 c.c. of Alcoholic Potassium Hydroxide Solution, indicating the absence of Aniline Sulphate. It should yield no ammoniacal odour when warmed with Potassium Hydroxide Solution, indicating the absence of Ammonium salts, although a piece of red Litmus paper suspended in the mouth of the test-tube will gradually acquire a blue colour. When ignited with free access of air the salt should leave no weighable residue, indicating the absence of mineral impurities.

Hypodermic Lamels, ½ grain of Sparteine Sulphate in each.

Oxysparteina and **Oxysparteinæ Hydrochloridum** and **Sulphas** have been used in medicine, the dose being about the same as that of Sparteina.

Not Official.

SCOPOLA.

The dried Rhizome of *Scopola Carniolica*, Jacq., known also on the Continent as *Scopolia atropoides*, Link.

The dried Rhizome is official in the *U.S.P.*, and is required to yield not less than 0·5 p.c. of mydriatic alkaloids.

It contains Hyoscyamine, Scopolamine (amorphous Hyoscine) and Atroscine (crystalline Hyoscine).

Medicinal Properties.—It has the same properties as Belladonna and Hyoscyamus.

This drug has not 'taken' in British practice, but it is used on an immense scale in America for the preparation of what is termed 'Belladonna' plaster.

Action of Scopolamine Hydrochloride on the eye.—*Pr.* liv. 469; *T.G.* '93, 338, 781; '94, 423, 480, 625, 680; *B.M.J.* '94, ii. 497.

Foreign Pharmacopœias.—Official in Jap. and U.S. Jap. has an **extract** prepared with weak Alcohol; a **plaster,** Extract 1, Resin Plaster 9; a **tincture,** Root 1, Dilute Alcohol 5; and an **ointment,** Extract 1, Lard 9. U.S. has extract and fluid extract (*see* below).

Tests.—10 grammes of the dried Rhizome in No. 60 powder when examined by the *U.S.P.* process for assay of Belladonna Leaves, given under Belladonna Folia, should yield a quantity of mydriatic alkaloids corresponding to not less than 0·5 p.c.

EXTRACT SCOPOLA.—The Extract of Scopola (*U.S.P.*) is prepared by evaporating the Fluid Extract to a pilular consistence in a porcelain dish at a temperature not exceeding 50° C. (122° F.), constantly stirring during the evaporation. It is required to contain 2 p.c. of mydriatic alkaloids, and the *U.S.P.* directs that should the Extract be found to contain more than this percentage sufficient powdered Milk Sugar should be added to reduce it to this standard.

Tests.—The *U.S.P.* method of assay is identical with that described under the *U.S.P.* process for the assay of Extract of Belladonna Leaves described under Belladonna Folia. Inasmuch, however, as 2 grammes of the Scopola Extract are used in the place of 5 grammes of the Extract of Belladonna Leaves, in calculating the result of the volumetric test into terms of mydriatic alkaloids the product must be multiplied by 50 instead of 20. The quantity of alkaloids yielded from the 2 grammes of Extract employed should correspond to 2 p.c.

FLUIDEXTRACTUM SCOPOLA.—The Fluid Extract of Scopola (*U.S.P.*) is prepared by exhausting dried Scopola Rhizome in No. 40 powder with a mixture of 4 volumes of Alcohol (94·9 p.c.) and 1 volume of Water. It is required to contain 0·5 of a gramme of the mydriatic alkaloids from Scopola.

Tests.—The Fluid Extract is assayed by a process identical with that given by the *U.S.P.* for the assay of Fluid Extract of Belladonna Root, and the process is described under Extractum Belladonnæ Liquidum. A measured quantity (10 c.c.) of the Fluid Extract is employed, and it is required to contain an amount of mydriatic alkaloids corresponding to 0·5 p.c. w/v.

Not Official.

SCUTELLARIA.

The Herb of *Scutellaria lateriflora*, L., commonly known as Mad-dog Skullcap. **Official in U.S.**

Scutellarin is a dry, light, greenish-brown powder, not a pure, proximate principle. It may be prepared by precipitating a concentrated tincture with Water.

Has been used in neuralgia, chorea, delirium tremens, and nervous exhaustion from fatigue or over-excitement.

Dose.—1 to 5 grains = 0·065 to 0·32 gramme.

A **fluid extract** (1 in 1) is also prepared, dose, ½ to 1 fl. drm. = 1·8 to 3·6 c.c. U.S. has fluid extract 1 in 1.

SENEGÆ RADIX.

SENEGA ROOT.

FR., POLYGALA DE VIRGINIE; GER., SENEGAWURZEL; ITAL., POLIGALA VIRGINIANA; SPAN., POLIGALA DE VIRGINIA.

The dried Root of *Polygala Senega*, L.

Senega Root contains Saponin, and will therefore emulsify Oils; it also contains Methyl Salicylate.

Medicinal Properties.—A stimulating expectorant. Chiefly used in chronic bronchitis, especially if secretion be scanty, combined with Ammonium Carbonate, Ipecacuanha, and Squill.

Official Preparations.—Infusum Senegæ, Liquor Senegæ Concentratus, and Tinctura Senegæ.

Not Official.—Fluidextractum Senegæ, Infusum Senegæ Concentratum, Syrupus Senegæ.

Foreign Pharmacopœias.—Official in all.

Descriptive Notes.—Typical Senega Root of good quality is yellowish-grey, curved irregularly, keeled on the inner or concave side, wrinkled longitudinally, and furnished with few branches. At the crown it is enlarged and shows traces of the bases of numerous slender stems. The fracture is short, and the horny translucent cortex is free from starch, and has an irregularly one-sided development of liber tissue which forms the keel; the woody centre is white. The taste is sweetish at first, then acrid, and the odour, especially in decoction, recalls that of Oil of Wintergreen (Methyl Salicylate). At intervals the root becomes scarce in commerce, and other varieties are offered, and the root is sometimes adulterated. A large root with a few principal branches at right angles, and with a crown sometimes 1 in. (25 mm.) across, with portions of the aerial stems attached, is known as Northern Senega, and is referred to the var. *latifolia*, T. and G. Another variety, known as Southern Senega, resembles typical Senega, but has less cortex in proportion, and the keel is absent. It is referred to *Polygala Boykini*, Nutt., or to *P. alba*, Nutt. Both of these differ from the official description in the absence of the keel. Occasionally other American medicinal roots have been found mixed with Senega either accidentally or purposely, but the only adulterant that might be confused with it is the rhizome of *Asclepias Vincetoxicum*, L., which closely resembles it in colour, and is apparently mixed with it in Europe. The distinct rhizomatous character of this adulterant at once distinguishes it, and the roots are crowded together and not contorted.

The distinctive features of the root under the microscope are the absence of starch, raphides, sclerenchymatous cells, and bast fibres, the presence of short tracheids, phloem parenchyma with oblique pores, collenchyma and drops of Oil in the parenchyma. The powdered root also readily gives a frothy solution when shaken with Water.

Tests.—Senega Root yields from 2 to 5 p.c. of ash. The Swiss Pharmacopœia employs the detection of the presence of Methyl Salicylate in the ethereal Extract as a test of identity. An ash limit is not considered necessary.

Preparations.

INFUSUM SENEGÆ. INFUSION OF SENEGA.

Senega Root, in No. 10 powder, 1; boiling Distilled Water, 20. Infuse half an hour, and strain. (1 in 20)

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.

Official in Belg., 3 of Fluid Extract in 100; Fr., Tisane de Polygala, 1 of Root in 100.

LIQUOR SENEGÆ CONCENTRATUS. CONCENTRATED SOLUTION OF SENEGA.

A fluid extract (1 in 2) made with a mixture of 2 parts of Alcohol (20 p.c.) and 1 part of Alcohol (45 p.c.); by percolation. (1 in 2)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Tests.—Concentrated Solution of Senega has a sp. gr. of 1·010 to 1·030; it contains from 10 to 20 p.c. w/v of total solids and from 18 to 22 p.c. w/v of Absolute Alcohol.

TINCTURA SENEGÆ. TINCTURE OF SENEGA.

1 of Senega Root, percolated with Alcohol (60 p.c.), to yield 5. (1 in 5)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Belg., 1 and 5, yielding 5 p.c. of dry residue; Mex., 1 in 5. Belg. has Polygalæ Extractum Fluidum, yielding 25 p.c. dry residue; Dan. has Fluid Extract, 1 in 1.

Tests.—Tincture of Senega has a sp. gr. of 0·935 to 0·940; it contains from 3 to 6 p.c. w/v of total solids and about 55 p.c. w/v of Absolute Alcohol.

Not Official.

FLUIDEXTRACTUM SENEGÆ.—100 of Senega Root in No. 40 powder macerated and percolated with a mixture of 60 of Alcohol (95 p.c.), 30 of Water and 3 of Solution of Potassium Hydroxide; continue the percolation with a mixture of Alcohol (95 p.c.) 2, and Water 1, until drug is exhausted; reserve the first 80, evaporate remainder to a soft extract, which dissolve in reserved portion, and make up to 100 with more of the mixture of Alcohol (95 p.c.) and Water.—*U.S.P.*

This has been incorporated in the *B.P.C.*

INFUSUM SENEGÆ CONCENTRATUM.—Senega Root, in No. 20 powder, 40; Strong Solution of Ammonia, 0·5; Oil of Wintergreen, 0·15; Alcohol (90 p.c.), 1; Dilute Chloroform Water (1 in 1000), 3; *q.s.* to make 100. Mix the powder with the Strong Solution of Ammonia and sufficient menstruum to damp it evenly. Complete by repercolation. Dissolve the Oil of Wintergreen in the product. Dose.—½ to 1 fl. drm.—*Farr* and *Wright*, *P.J.* '06, i. 165 and '07, i. 622; *C.D.* '06, i. 252; and *Y.B.P.* 1907, 251.

This appears in the *B.P.C.*

SYRUPUS SENEGÆ (*U.S.*).—Fluid Extract of Senega *U.S.* as above, 20; Syrup, 80.

This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in Austr., Senega Root 5, Alcohol (90 p.c.) 5, Water *q.s.* to yield 45, Sugar 75; Belg., Fluid Extract 5, Syrup 95;

Dan., Senega Root 4, Water *q.s.* to yield 37, Sugar 63; Dutch, Ger., Jap. and Russ., Senega Root 5, Alcohol (90 p.c.) 5, Water *q.s.* to yield 40, Sugar 60; Fr., Senega Root 1, Boiling Water 15; decant and add to each 10 of liquor 18 of Sugar; Hung., Senega Root 1, Dilute Alcohol 1, Water *q.s.* to yield 10, Sugar 17; Ital., Senega Root 1, Water 12, Sugar 18; Mex., Extract 0·5, Alcohol (60 p.c.) 9·5, Syrup 90; Norw., Senega Root 4, Water *q.s.* to yield 40, Sugar 60; Span., Senega Root 15, Water *q.s.* to yield 360, Sugar 640; Swed., Senega Root 5, Water *q.s.* to yield 37, Sugar 63; Swiss, a Fluid Extract is made by percolating 50 of the root with a mixture of Alcohol (90 p.c.) 1, and Water 5; and after the addition of Ammonium Hydricum Solutum 5, evaporate to 50 and add Glycerin 50. To each 10 of this Fluid Extract add 90 of Syrup.

SENNA.

SENNA.

Fr., Séné; Ger., Sennesblätter; Ital., Sena; Span., Sen de Espana.

The British Pharmacopœia recognises two kinds; **Alexandrian Senna**, the dried Leaflets of *Cassia acutifolia*, Delile, and **East Indian Senna**, the dried Leaflets of *Cassia angustifolia*, Vahl.

When Senna is ordered in an official preparation either of the above may be used.

U.S. has also an Indian and Alexandrian Senna; Ger. an East Indian Senna.

The different kinds of Senna, freed from stalks, are of nearly equal medicinal value.

Medicinal Properties.—An efficient purgative in occasional or habitual constipation.

Prescribing Notes.—*As it produces griping and nausea, it is given with aromatics, such as Fennel in Compound Liquorice Powder, and Oil of Coriander in Syrup of Senna. The infusion is a suitable vehicle for Magnesium Sulphate and similar medicines.*

Dose.—10 to 30 grains = 0·65 to 2 grammes.

Official Preparations.—Confectio Sennæ, Infusum Sennæ, Liquor Sennæ Concentratus, Syrupus Sennæ, and Tinctura Sennæ Composita. Contained in Pulvis Glycyrrhizæ Compositus. The **infusion** is used in the preparation of Mistura Sennæ Composita.

Not Official.—Elixir Sennæ, Extractum Sennæ Leguminorum Liquidum, Extractum Sennæ Fructuum Fluidum, Infusum Sennæ Concentratum, Infusum Sennæ Compositum, Lavement Purgatif and Acidum Catharticum.

Foreign Pharmacopœias.—Official in all.

Tests.—Senna contains from 8 to 14 p.c. of ash. Fourteen samples examined in the author's laboratory gave from 10 to 11·5 p.c., with an average of 10·7 p.c. The ash should be almost entirely soluble in Hydrochloric Acid.

SENNA ALEXANDRINA. Alexandrian Senna.

The dried Leaflets of *Cassia acutifolia*, Delile.

Descriptive Notes.—Alexandrian Senna arrives in this country in packages containing leaves roughly sorted into 1st and 2nd qualities, and the pods. The leaves are sifted and picked over on arrival in this country, in order to separate inferior leaves, broken twigs, and various impurities, and to grade the leaves into different sizes and qualities. The leaves, or more correctly leaflets, are opaque, of a light yellowish-green tint, varying from $\frac{3}{4}$ to $1\frac{1}{4}$ in. (19 to 30 mm.) in length, lanceolate or oval, acute, mucronate, entire, unequal at the base, usually covered with a short fine pubescence, densest on the mid-rib, and the veins are conspicuous, especially on the under surface. The odour is tea-like but characteristic, and the taste mucilaginous, nauseous in a watery infusion. The characteristic feature is that the leaves are widest below the middle.

The leaves were formerly adulterated with Argel leaves, but these are now rarely met with; these are readily distinguished by their equal base and minutely wrinkled surface. Alexandrian Senna leaves, as imported, vary chiefly in size, amount of debris and discoloured leaves present, the sifted and 'elect' Senna being worth about twice, and the hand-picked leaves three to four times, the value of the crude drug as imported. The siftings, or small Senna, free from dust and sand, but containing about one-third of the weight of stalks and debris, are sold at about half the price of the crude drug. Occasionally the leaves of *Cassia obovata*, Collad., are found in Alexandrian Senna, and they are also occasionally imported separately; they are obovate in shape, and therefore easily recognised, but are considered to be less active than those of *C. acutifolia*. The pods of *C. acutifolia* are imported separately; the infusion is said to be milder in odour and flavour and slower in its action than that of the leaves, although equally effective. Powdered Senna is characterised by the 1-celled short hairs, slightly contracted below and tapering above, with thick and minutely papillose walls, by the cluster crystals in the parenchymatous cells, and the seriate single prismatic crystals in the cells near the fibres of the veins, the polygonal epidermal cells and the long palisade cells.

Argel leaves have 3-celled hairs, contain latex cells, and have short palisade cells.

SENNA INDICA. EAST INDIAN SENNA. *B.P.Syn.*—TINNEVELLY SENNA.

The dried Leaflets of *Cassia angustifolia*, Vahl. From plants cultivated in Southern India.

Descriptive Notes.—East Indian Senna leaflets are from 1 to 2 in. (25 to 50 mm.) in length, lanceolate and acute, with the greatest diameter near the middle, and rather less hairy than the Alexandrian kind. But the drug varies much in different samples, and like the Alexandrian needs sifting and sorting on arrival in this country. The different grades vary in size of the leaflets, freedom from discoloured leaflets and stalks and in their colour, the cultivated or Tinnevelly leaflets being usually greener, while those imported from Arabia, and known as Mecca Senna, are smaller, contain more stalks, are of a more faded or greyish-green tint, and often many discoloured leaflets are present.

The official description evidently indicates the better grades of the drug. Under the microscope the powder of the leaflets offers few distinguishing features from that of the Alexandrian kind.

According to Sayre (*P.J.* (4) iii. p. 458) the epidermal cells are smaller and more uniform in size and shape, with sharper angles, the cells of the Alexandrian being 40 μ and those of East Indian Senna 35 μ in diameter, and the hairs are shorter and less curved and less numerous, but the stomata are less round and more elongated or oval than the Alexandrian Senna, although they have also the appearance of two parallel cells near the ostiole, due to the two guard cells being below the epidermis. The pods of East Indian Senna are longer than those of Alexandrian Senna. Those of *C. obovata*, Collad., differ in having short transverse ridges in the centre of the pod.

Preparations.

CONFECTIO SENNÆ. CONFECTION OF SENNA. *N.O.Syn.*—LENITIVE ELECTUARY.

Senna, 7; Coriander Fruit, 3; Figs, 12; Tamarinds, 9; Cassia Pulp, 9; Prunes, 6; Extract of Liquorice, 1; Refined Sugar, 30. The Figs, Prunes, Tamarinds and Cassia Pulp are treated with Distilled Water and pulped through a sieve; when mixed with the other ingredients the yield should be 75, by weight. (1 in 11 nearly)

Dose.—60 to 120 grains = 4 to 8 grammes.

Foreign Pharmacopœias.—Official in all except Belg., Dan., Fr., Mex., Span. and Swed., but differing in composition.

INFUSUM SENNÆ. INFUSION OF SENNA.

Senna, 2 oz.; Ginger, sliced, 1/8 oz. (55 grains); Distilled Water, boiling, 20 fl. oz. Infuse 15 minutes, and strain. (1 in 10)

From 20 fl. oz. of Infusion only about 14 fl. oz. drain out.

Dose.—½ to 1 fl. oz. = 14·2 to 28·4 c.c.; as a draught, 2 fl. oz. = 56·8 c.c.

LIQUOR SENNÆ CONCENTRATUS. CONCENTRATED SOLUTION OF SENNA.

20 of Senna, treated by continuous percolation with Distilled Water to yield 16 of fluid, which is heated to 180° F. (82·2° C.) for 5 minutes, and cooled. To this is added a mixture of Alcohol (90 p.c.) 2, and Tincture of Ginger 2½. It should yield 20, by measure. (1 in 1)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Tests.—Concentrated Solution of Senna has a sp. gr. of 1·020 to 1·080; it contains from 12 to 18 p.c. w/v of total solids and about 18 p.c. w/v of Absolute Alcohol.

MISTURA SENNÆ COMPOSITA. COMPOUND MIXTURE OF SENNA. *B.P.Syn.*—BLACK DRAUGHT.

Magnesium Sulphate, 5; Liquid Extract of Liquorice, 1; Compound Tincture of Cardamoms, 2; Aromatic Spirit of Ammonia, 1; Infusion of Senna, *q.s.* to yield 20. (1 of Magnesium Sulphate in 4)

B.P. 1885 contained Tincture of Senna, less Compound Tincture of Cardamoms, and no Aromatic Spirit of Ammonia.

Dose.—As a draught, 1 to 2 fl. oz. = 28·4 to 56·8 c.c.

Foreign Pharmacopœias.—Infusum Sennæ Compositum:—Dan., Coriander 2, Fructus Vitis viniferæ apyrenæ 5, Senna 10, Manna 25, Potassium Tartrate 3, boiling Water, *q.s.* to yield 720; Dutch, Senna 10, Anise 3, Water, *q.s.* to yield 80, Sodium Potassium Tartrate 10, Glycerin 10; Belg., Fluid Extract of Senna 10, Fluid Extract of Glycyrrhiza 5, Manna 20, Water 65; Ger. and Jap., Senna 50, Boiling Water 450, Sodium Potassium Tartrate 50, Sodium Carbonate 1, Manna 100, Water, *q.s.* to yield 475, Alcohol (90 p.c.) 25; Norw., Senna 10, Coriander 2, Boiling Water, *q.s.* to yield 70, Manna 25, Potassium Tartrate 5; Russ., Senna 10, Boiling Water 60, Sodium Potassium Tartrate 10, Manna 15, Alcohol (90 p.c.) 3; Swed., Senna 10, Manna 20, Sodium Potassium Tartrate 10, Distilled Water, *q.s.* to yield 100; Swiss, Fennel 5, Senna 10, Manna 10, Sodium Tartrate 10, Water, *q.s.* to yield 100; U.S., Senna 6, Manna 12, Magnesium Sulphate 12, Fennel 2, Boiling Water 80, Cold Water, *q.s.* to yield 100; Austr. (Infusum Sennæ cum Manna) Senna 12, Water 100, Manna 15, Magnesium Carbonate 1; Fr. (Apozème Purgatif), Senna 2, Rhubarb 1, Sodium Sulphate 3, Manna 12, Boiling Distilled Water 20; Hung. (Infusum laxativum), Senna 20, Boiling Water 160, Manna 30; Ital. (Infuso di Sena con Manna) Senna 10, Water, *q.s.* to yield 150, Manna 25; Port. (Infuso de Senne Composto) Senna 10, Anise 2, Manna 20, Sodium Potassium Tartrate 10, Boiling Water 100; Span. (Infusion de Mana Laxante) Manna 60, Senna 20, Magnesium Sulphate 9, Water, *q.s.* to yield 300; also Infusion de Mana Purgante, Manna 90, Senna 12, Cinnamon Water 1, Water, *q.s.* to yield 300. Russ. has also Infusum Sennæ Salinum, Senna 10, Boiling Water 100, Sodium Sulphate 10, Refined Honey 10.

Tests.—Compound Mixture of Senna has a sp. gr. of 1·115 to 1·120; it contains about 16 p.c. w/v of total solids and about 12 p.c. w/v of Absolute Alcohol.

SYRUPUS SENNÆ. Syrup of Senna.

50 oz. of Sugar is dissolved with the aid of heat in 40 fl. oz. of a liquid extract of Senna (1 in 1); and when cool 10 minims of Oil of Coriander dissolved in 40 minims of Alcohol (90 p.c.) is added. It should yield 92 oz., by weight. (1 in 1¾)

Dose.—½ to 2 fl. drm. = 1·8 to 7·1 c.c.

Foreign Pharmacopœias.—Syrupus Sennæ:—Dutch, Senna 10, Water, *q.s.* to yield 38, Sugar 62; Ger. and Jap., Senna 10, Fennel 1, moisten them with Alcohol (90 p.c.) 5, pour on them Distilled Water 60, and extract in the cold for 12 hours, strain without pressing, boil the strained liquid, filter, after cooling dissolve in 35 of the filtrate 65 of Sugar; U.S., Fluid Extract of Senna 250, Coriander Oil 5, Syrup, *q.s.* to make 1000. Syrupus Sennæ Compositus:—Austr., Senna 10, Anise 1, Water 100; strain, and to each 10 add Manna 2, Sugar 15; Belg., Fluid Extract of Senna 75, Fluid Extract of Glycyrrhiza 15, Spirit of Anise 10, Syrup 900. Syrupus Sennæ Mannatus:—Dan., Manna 150, Senna 100, Fennel 5, Ginger 5, Distilled Water, *q.s.* to yield 500, Sugar 500; Norw., Fennel 1, Ginger 1, Senna 10, Manna 15, Boiling Water, *q.s.* to yield 50, Sugar 50; Swed., Fennel 1, Senna 10, Manna 15, Distilled Water, *q.s.* to yield 50, Sugar 50. Hung., Syrupus Mannatus, Senna 30, Anise 3, Sodium Carbonate 3, Alcohol (70 p.c.) 30, Water, *q.s.* to yield 300, add Sugar 400, Manna 90. Ital., Sciroppo di Sena e Manna, Senna 15, Anise 2, Water, *q.s.* to yield 130, in which dissolve Manna 60, Sugar 200. Mex., Jarabe de Sen, Extract of Senna 2·5, Water 7·5, Syrup 90. Jap. has also Sirupus Sennæ cum Manna, Senna 35, Fennel 2, pour on them boiling Water 350, set aside for 12 hours; express; in the expressed liquid 350, dissolve Manna 50, Sugar 400, allow to subside; decant the upper clear liquid; evaporate till it attains a syrupy consistence and strain.

Tests.—Syrup of Senna has a sp. gr. of 1·290 to 1·320.

TINCTURA SENNÆ COMPOSITA. Compound Tincture of Senna.

Senna, 4; Raisins of commerce, freed from seeds, 2; Caraway Fruit, ½; Coriander Fruit, ½; Alcohol (45 p.c.), 20; by maceration.

(1 in 5)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c., for repeated administration; for a single administration, 2 to 4 fl. drm. = 7·1 to 14·2 c.c.

Foreign Pharmacopœias.—Official in Mex., 1 in 5. Fluid extract official in U.S. 1 in 1; Belg., yelding 20 p.c. dry residue. Belg. and Dan. have an alcoholic extract.

Tests.—Compound Tincture of Senna has a sp. gr. of 0·985 to 0·995; it contains about 10 p.c. w/v of total solids and about 39 p.c. w/v of Absolute Alcohol.

Not Official.

ELIXIR SENNÆ.—16 fl. oz. of a liquor obtained from 16 oz. of Alexandrian Senna by two macerations with a mixture of 4 of Alcohol (90 p.c.) and 12 Distilled Water, is heated with 12 oz. of Sugar to 200° F. (93·3° C.) for 10 minutes. Mix Chloroform, 24 minims; Oil of Coriander, 2½ minims; Tincture of Capsicum, ½ fl. drm., and Alcohol (90 p.c.), 3 fl. drm. Add them to the Syrup, and make up if necessary to 24 fl. oz. with Alcohol (60 p.c.).—*B.P.C. Formulary* 1901, now incorporated in the *B.P.C.* with the synonym Liquor Sennæ Dulcis.

Dose.—1 to 3 fl. drm. = 3·6 to 10·6 c.c.

EXTRACTUM SENNÆ LEGUMINORUM LIQUIDUM.—20 fl. oz. of liquor obtained from 20 oz. of Senna Pods by two macerations with a mixture of 1 of Alcohol (90 p.c.) with 2 of Distilled Water. Heat to 200° F. (93·3° C.) for 10 minutes, and when cold add if necessary more of the mixture to make 20; filter.—*B.P.C. Formulary* 1901, now incorporated in the *B.P.C.* under the title **Extractum Sennæ Liquidum**.

Dose.—1 fl. drm. = 3·6 c.c.

EXTRACTUM SENNÆ FRUCTUUM FLUIDUM.—Exhaust Senna Pods with cold Water and evaporate the resulting liquid *in vacuo*, so that 1 of Fluid Extract shall equal 1 of Senna Pods.

INFUSUM SENNÆ CONCENTRATUM.—Senna Leaves, broken small, 80; Strong Tincture of Ginger, 2·5; Dilute Chloroform Water (1 in 1000), sufficient to make 100. Prepare by macero-expression. After completing the process, add the Strong Tincture of Ginger. Heat in a closed vessel by means of a water-bath to a temperature of 85° C., and maintain thereat for 5 minutes. Dose.—½ to 1 fl. drm.; as a draught, 2 fl. drm. diluted with Water. *Farr* and *Wright*, *P.J.* '06, i. 165 and '07, i. 622; *C.D.* '06., i. 252; and *Y.B.P.* 1907, 251.

The *B.P.C.* includes a modification of this, the macero-expression is conducted with a mixture of Alcohol (90 p.c.), 1; Diluted Chloroform Water, 3; in place of the Chloroform Water as given above.

INFUSUM SENNÆ COMPOSITUM.—Senna, 6; Manna, 12; Magnesium Sulphate, 12; Fennel, bruised, 2; Boiling Water, 80; Cold Water, *q.s.* to make 100. Upon the Senna, Manna and Fennel pour the boiling Water and macerate for half an hour, strain with expression, dissolve the Magnesium Sulphate in the infusion and again strain and pass cold Water through the strainer to make 100.—*U.S.P.*

Dose.—4 fl. oz. = 113·6 c.c.

This has been incorporated in the *B.P.C.*

LAVEMENT PURGATIF.—Pour 500 of boiling Water on to 15 of Senna Leaves and infuse half an hour, strain through a cloth, press, and dissolve in the fluid 15 of Sodium Sulphate.—*Fr.*

ACIDUM CATHARTICUM.—According to Stockman, Cathartic Acid is a coloured glucoside. In the free state it is easily decomposed. It acts locally as an irritant and hence as a purgative when introduced into the alimentary canal. —*P.J.* (3) xv. 751.

Bourgoin and Bouchut, in a lengthy investigation on Cathartic Acid and Senna, conclude, 'As a general result of this inquiry it appears that the best preparation is the Infusion of Senna.'—*P.J.* (3) ii. 223.

SERPENTARIÆ RHIZOMA.

SERPENTARY RHIZOME.

The dried Rhizome and Roots of *Aristolochia Serpentaria*, L., *Virginian Snakeroot*, or of *Aristolochia reticulata*, Nutt., *Texan* or *Red River Snakeroot.*

From the southern parts of North America.

Under the title of **Aristolochia** the dried Stem and Root of *Aristolochia indica*, L., are official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Medicinal Properties.—A bitter stomachic. *See* Calumba.

Dose.—10 to 15 grains = 0·65 to 1 gramme.

Official Preparations.—Infusum Serpentariæ, Liquor Serpentariæ Concentratus, and Tinctura Serpentariæ. Used in the preparation of Tinctura Cinchonæ Composita.

Not Official.—Infusum Serpentariæ Concentratum.

Foreign Pharmacopœias.—Official in Mex., Port. and U.S.

Descriptive Notes.—In the *B.P.* 1864 and 1867 the root of Aristolochia Serpentaria was alone official, but the drug was rarely met with in commerce, the root of the Texan species, *A. reticulata*, being the article representing it in this country. In the *B.P.* 1885 and 1898 the latter species was made official, as well as the Virginian (*A. Serpentaria*), and both are now obtainable. The latter has much more slender, matted, fibrous, furrowed roots, those of *A. reticulata* being longer, thicker, straighter and smoother. The rhizome of *A. Serpentaria* is about 1 in. (25 mm.) long and $\frac{1}{8}$ in. (3 mm.) in diameter, bearing on its upper surface the remains of aerial stems, and the numerous slender, very interlacing roots are about 3 in. (75 mm.) long, yellowish-brown in colour, have a bitter taste, and an odour recalling those of Camphor, Turpentine and Valerian. The rhizome of *Spigelia Marilandica*, L., resembles that of *A. Serpentaria* in size and appearance, but it is not aromatic.

The characteristic microscopic features of Serpentary Root are the cuboid cells of the outer bark, the porous cuboid cells of the medullary rays, the oil cells in the mesophlœum, and the abundance of starch.

Tests.—Serpentary Rhizome contains from 7 to 10 p.c. of ash. An ash limit is not considered necessary.

Preparations.

INFUSUM SERPENTARIÆ. Infusion of Serpentary.

Serpentary Rhizome, in No. 10 powder, 1; boiling Distilled Water, 20. Infuse 15 minutes, and strain. (1 in 20)

Dose.—$\frac{1}{2}$ to 1 fl. oz. = 14·2 to 28·4 c.c.

LIQUOR SERPENTARIÆ CONCENTRATUS. CONCENTRATED SOLUTION OF SERPENTARY.

A fluid extract (1 in 2) made with Alcohol (20 p.c.). (1 in 2)

Dose.—½ to 2 fl. drm. = 1·8 to 7·1 c.c.

Tests.—Concentrated Solution of Serpentary has a sp. gr. of 0·990 to 1·000; it contains about 5 p.c. w/v of total solids and about 18 p.c. w/v of Absolute Alcohol.

A corresponding preparation, **Liquor Aristolochiæ Concentratus** (1 in 2), dose, 30 to 120 minims = 1·8 to 7·1 c.c., is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

TINCTURA SERPENTARIÆ. TINCTURE OF SERPENTARY.

1 Serpentary Rhizome, percolated with Alcohol (70 p.c.), to yield 5. (1 in 5)

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Foreign Pharmacopœias.—Official in Mex. and U.S., 1 in 5. U.S. has also **Fluid Extract.**

Tests.—Tincture of Serpentary has a sp. gr. of 0·895 to 0·900; it contains about 2 p.c. w/v of total solids and about 68 p.c. w/v of Absolute Alcohol.

A corresponding preparation, **Tinctura Aristolochiæ** (1 in 5), dose, 30 to 60 minims = 1·8 to 3·6 c.c., is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Not Official.

INFUSUM SERPENTARIÆ CONCENTRATUM.—Serpentary Rhizome, in No. 20 powder, 40; Alcohol (90 p.c.), 25; Dilute Chloroform Water (1 in 1000), *q.s.* to make 100. Prepare by repercolation.—*Farr* and *Wright*, *P.J.* '06, i. 165 and '07, i. 622; *C.D.* '06, i. 252; and *Y.B.P.* 1907, 251.

This appears in the *B.P.C.*

SEVUM PRÆPARATUM.

PREPARED SUET.

FR., SUIF DE MOUTON PURIFIÉ; GER., HAMMELTALG; ITAL., GRASSO DI MONTONE; SPAN., SEBO DE CARNERO.

A white, almost inodorous, fatty substance, having a bland taste and unctuous to the touch. It is insoluble in Water. It is described in both *B.P.* and *U.S.P.* as the internal fat of the abdomen of the sheep, *Ovis Aries*, L., purified by melting and straining. The *U.S.P.* states that Prepared Suet should be kept in well-closed vessels impervious to fat. The *B.P.* gives no directions as to the precautions necessary in storage. The *U.S.P.* also states that it should not be used after it has become rancid.

Official Preparation.—Used in the preparation of Unguentum Hydrargyri.

Foreign Pharmacopœias.—Official in all except Belg., Dutch and Russ.; Fr. (Suif de Mouton Purifié); Ital. (Grasso di Montone); Mex., Port. and Span. (Sebo).

Tests.—Prepared Suet possesses a m.p. of from 45° to 50° C. (113° to 122° F.); the *B.P.* states from 44·4° to 48·9° C. (112° to 120° F.); the *U.S.P.* from 45° to 50° C. (113° to 122° F.); the *P.G.* from 47° to 50° C. (116·6° to 122° F.). The solidifying point is about 38° C. (100·4° F.); the *B.P.* states 37·8° C. (100° F.); the *U.S.P.* 37° to 40° C. (98·6° to 104° F.); the *P.G.* does not mention a solidifying point. It is officially required to be freely soluble in Benzol, insoluble in cold Alcohol (90 p.c.), and slightly soluble in Ether or boiling Alcohol (90 p.c.). Acid, Saponification, and Iodine values might with advantage have been included. The Acid value ranges from 0·8 to 2, the Saponification value from 192 to 195, the Iodine value from 33 to 46.

It is officially stated that in India Benzoated Suet should be used in place of Benzoated Lard, *see* p. 100.

Not Official.

SIMARUBA.

BITTER SIMARUBA, OR MOUNTAIN DAMSON.

The Root-bark of *Simaruba officinalis*, DC., from the West Indies.

Medicinal Properties.—A bitter tonic and astringent. In large doses causes nausea. Principally used in chronic forms of dysentery; may be combined with Opium.

Dose.—15 to 30 grains = 1 to 2 grammes.

Foreign Pharmacopœias.—Official in Dutch, Mex., Port. and Swiss.

SINAPIS.

MUSTARD.

Fr., Moutarde; Ger., Senfsamen; Ital., Senape Nera; Span., Mostaza.

The powdered and mixed dried ripe Seeds of *Brassica nigra* and *Brassica alba.*

The whole virtue of Mustard depends upon the fact that when mixed with Water, Allyl Thiocarbimide (Volatile Oil of Mustard) is formed. This compound is produced by the action of Myrosin upon Myronic Acid in the same way in which the Emulsin and Amygdalin react in the formation of Volatile Oil of Bitter Almonds. Black Mustard contains Myrosin and a large excess of Myronic Acid, and so is in itself able to produce the Volatile Oil to some extent. White Mustard contains Myrosin but no Myronic Acid, and so can by itself produce none of the Volatile Oil. The best result is obtained by mixing the black and white variety in such proportions that the Myrosin and the Myronic Acid will balance each other.

Medicinal Properties.—A powerful stimulant and sialagogue. The powder is taken internally as a condiment; a tablespoonful in a tumblerful of warm Water acts as a prompt emetic; used externally in form of poultice or charta, as a rubefacient and counter-irritant in pneumonia, pleurisy, muscular rheumatism, pericarditis, bronchitis, colic, gastralgia, vomiting and neuralgia; as a sitz-bath in amenorrhœa.

Official Preparations.—Charta Sinapis, Linimentum Sinapis, and Oleum Sinapis Volatile.

Not Official.—Applicatio Sinapis, Cataplasma Sinapis, Infusum Sinapis, Thiosinamin and Fibrolysin.

Foreign Pharmacopœias.—Official in Port. (Mostarde).

Tests.—Mustard yields about 5 p.c. of ash. It is officially required that a cold decoction should not be rendered brown by Boric Acid Solution, indicating the absence of Turmeric, nor should it yield a distinctive reaction with the tests for Starch. The test for Turmeric may be conveniently carried out with Methylated Spirit as a solvent instead of Water. About 1 gramme of the specimen should be boiled with Methylated Spirit, filtered, the filtered liquid concentrated and tested with Boric Acid Solution. The Iodine test for the presence of Starch is rendered negative, owing to the ready absorption of the Iodine by the volatile Oil developed on the addition of Water. In carrying out the Iodine test for Starch on the powdered seeds of the White or Black Mustard, the *U.S.P.* directs that 1 gramme of the powdered Mustard should be exhausted by slow percolation with Alcohol (94·9 p.c.), the marc mixed with 200 c.c. of Water and heated to boiling, adding after cooling sufficient cold Water to make the mixture measure 1000 c.c.; the addition of 4 c.c. of Tenth-normal Volumetric Iodine Solution should not produce a dark blue colour. The *German Pharmacopœia* includes a quantitative method for the determination of the ethereal Oil. A weighed quantity of 5 grammes of the powdered Mustard is digested in a flask with 100 c.c. of Water at a temperature of 20° to 25° C. (68° to 77° F.). The stoppered flask is allowed to remain at rest for 2 hours; to the contents are then added 20 c.c. of Alcohol (90 p.c.) and 2 c.c. of Olive Oil, the flask connected with a well-cooled condenser, and the mixture is distilled. The first 40 to 50 c.c. of distillate is collected in a graduated flask of 100 c.c. capacity, containing 10 c.c. of Ammonia Solution, and 20 c.c. of Tenth-normal Silver Nitrate Solution are added. The mixture is then diluted with Water to the mark on the neck and allowed to stand in a stoppered flask for 24 hours, with intervals of frequent shaking. To a measured quantity (50 c.c.) of the clear filtrate is then added 6 c.c. of Nitric Acid and 1 c.c. of Ferric Ammonium Sulphate Solution, and the mixture is titrated with Tenth-normal Volumetric Ammonium Rhodanate Solution until a red coloration appears, not more than 7·2 c.c. of this solution should be required; each c.c. of Tenth-normal Volumetric Silver Nitrate Solution absorbed represents 0·0049575 gramme of Allyl Thiocarbimide. The amount of Water present should not exceed 5 p.c.

SINAPIS ALBÆ SEMINA. WHITE MUSTARD SEED.

The dried ripe Seeds of *Brassica alba*.

Descriptive Notes.—The White Mustard Seed of commerce is often a mixed article, depending upon its geographical source, but the official article is the seed of *Brassica alba*, Boiss. (*Sinapis alba*, L.). The seed is yellowish, about $\frac{1}{12}$ in. (2 mm.) in diameter and $\frac{1}{10}$ of a grain in weight (*Pharmacographia*, p. 69). The testa appears to be smooth, but under a good lens is seen to be minutely and reticulately pitted. The embryo is of a bright, pure yellow colour and oily. It has no pungent odour until triturated with Water. The outer layer of epidermal cells contains mucilage and swells up rapidly in Water, a property which is sometimes taken advantage of for drying bottles intended to contain oily liquids, and from which it is necessary to remove the last trace of moisture. This is quickly effected by shaking a small quantity of White Mustard Seed in the bottle. The seeds of a false White Mustard, named by Harz *Brassica iberifolia*, have been substituted for those of *B. alba*, but they are slightly more ochreous in colour, the hilum is darker than the rest of the seed, and the epidermal cells are not mucilaginous.

The pods containing White Mustard Seed are spreading, and have bristly hairs, and half their length is occupied by a flat, veiny beak. In Black Mustard the pods are erect and glabrous, and the short beak is slender and quadrangular.

The seeds of *S. glauca*, Roxb. (*B. campestris*, L.), resemble those of *B. alba* and probably form part of the White Mustard Seed of India.

SINAPIS NIGRÆ SEMINA. Black Mustard Seed.

The dried ripe Seeds of *Brassica nigra*, Koch.

Descriptive Notes.—The Black Mustard Seed of commerce is usually brown rather than black, and often consists chiefly of the slightly larger and more oblong Indian or Sarepta Mustard Seeds, which are the produce of *Brassica juncea*, Cass. The seeds of *Brassica nigra*, Koch, which are official under the name of Sinapis Nigræ Semina, are $\frac{1}{25}$ in. (1 mm.) in diameter and $\frac{1}{50}$ of a grain in weight and of a dark reddish-brown or greyish-brown colour, and have at first a bitter and quickly afterwards a very pungent taste. Although reticulated with minute pits when dry, the surface of the seed appears smooth when wetted, owing to the development of mucilage from the outer walls of the epidermal cells. The whitish pellicle, which gives the greyish tint to some of the seeds, is attributed to rain during the ripening, and depreciates the value of the seed in the market; this pellicle is formed from hexagonal tabular cells. The seed contains about 20 p.c. of fixed Oil, which is expressed and sold separately as a remedy for rheumatism, although it is used in Russia like the best Olive Oil (*Pharmacographia*). The ferment Myrosin is coagulated at 140° F. (60° C.), so that boiling Water must not be used in making Mustard plasters. The prepared Mustard leaves must be kept quite dry, or the ferment gradually acts in the presence of the moisture attracted from the air, and the Mustard leaves lose their efficacy. Powdered Mustard that has become damp is liable to become attacked by the cheese mite *Tyroglyphus Siro*, Gerv. The distinctive microscopic features of powdered Mustard are the absence of Starch and raphides; the mucilaginous epidermal polygonal cells, appearing striated when wet, large collenchymatous cells, and the yellow sclerenchyma of *S. alba*, and the dark yellowish-brown sclerenchymatous cells of *S. nigra*, some of which are rather longer and form a hexagonal network, and the small, irregular aleurone grains (0·017 mm. long and 0·008 mm. broad) containing minute globoids and drops of fixed oil.

Preparations.

CHARTA SINAPIS. Mustard Paper.

Extract by Benzol the fixed Oil from a mixture of equal weights of bruised Black and White Mustard Seeds; dry, and reduce to No. 60 powder; mix 75 grains of it with 5 fl. drm. of Solution of India-rubber, and spread by means of a suitable brush over about 30 sq. in. of one side of a piece of cartridge paper. Allow it to dry by exposure to the air.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Norw.; Fr. (Sinapismes en Feuilles); Dan., Ger., Hung. and Swed. (Charta Sinapisata); Ital. (Carta Senapata); Mex. (Sinapismos de Papel); Span. (Papel Sinapico); Russ. (Charta Sinapina); Swiss and U.S.

LINIMENTUM SINAPIS. Liniment of Mustard.

Volatile Oil of Mustard, 1½ fl. drm.; Camphor, 120 grains; Castor Oil, 5 fl. drm.; Alcohol (90 p.c.), 4 fl. oz.

Now about 1 in 27 instead of 1 in 40, and Ethereal Extract of Mezereon omitted.

As the volatile Oil quickly disappears on keeping, it is better to keep the other ingredients ready mixed, and to add the Mustard Oil when required.

Spiritus Sinapis.—Austr. and Hung., Oil 1, Spirit 50; Belg., Ger., Jap., Russ., Swed. and Swiss, Oil 1, Spirit 49; Mex. (Linimento de Mostaza Compuesto), 1 in 38. All by weight.

OLEUM SINAPIS VOLATILE. Volatile Oil of Mustard.

An almost colourless, or pale yellow, highly refractive, limpid, oily liquid, possessing a very characteristic, penetrating, pungent, and excessively irritating odour. It is the volatile oil distilled from Black Mustard Seeds after maceration with Water.

The *B.P.* describes the Oil as distilled from Black Mustard Seeds after maceration with Water. The *U.S.P.* describes it as a volatile Oil obtained from Black Mustard (freed from its fatty oil by maceration with Water and subsequent distillation). The *P.G.* describes it as a volatile Oil obtained by distillation from powdered Mustard Seeds which have been macerated in Water. The *B.P.* do not require it to contain any definite percentage of Allyl Iso-thiocyanate. The *U.S.P.* requires that it shall contain not less than 92 p.c. The *P.G.* requires that it shall contain from 92·4 to 99 p.c.

It should be kept in well-stoppered glass bottles of a dark amber tint in a cool atmosphere and protected as far as possible from contact with the light. Its vapour is intensely irritating, and the greatest caution should be exercised in handling the oil.

Solubility.—1 in 50 of Water; readily in Alcohol (90 p.c.) and Ether.

Medicinal Properties.—Applied to the skin, it produces almost instant vesication, but when diluted it forms a useful counter-irritant application.

Foreign Pharmacopœias.—Official in all except Dan.

Tests.—Volatile Oil of Mustard has a sp. gr. of 1·015 to 1·030. The *B.P.* states 1·018 to 1·030, the *U.S.P.* 1·013 to 1·020 at 25° C. (77° F.), the *P.G.* 1·018 to 1·025. It boils at 148° C. (298·4° F.), and distils between this temperature and 153° C. (307·4° F.). It is officially stated to distil between 147·2° and 152·2° C. (297° and 306° F.); the *U.S.P.* states that if a portion of the Oil be heated in a flask connected with a well-cooled condenser it should distil completely between 148° and 152° C. (298·4° and 305·6° F.). The *P.G.* that the boiling point is between 148° and 152° C. (298·4° and 305·6° F.); with the simple statement of these physical characteristics the *B.P.* is content. The *U.S.P.* and the *P.G.* state that if to 3 grammes of the Oil 6 grammes of Sulphuric Acid be gradually added, keeping the liquid cool, the mixture upon subsequent digestion will evolve Sulphur Dioxide gas, that it will remain of a light yellow colour, and although at first clear will afterwards become thick and occasionally crystalline, and will lose its pungent odour. These two Pharmacopœias also mention that when diluted with 5 times its volume of Alcohol (94·9 p.c. *U.S.P.*, 90 p.c. *P.G.*) the addition of a drop of Ferric Chloride Test Solution shall produce no blue or violet coloration. The *B.P.* does not introduce a method of assay. The *U.S.P.* requires that it shall contain not less than 92 p.c. of Allyl Iso-thiocyanate as determined by a process of which the following are the essential details:—A quantity of about 2 grammes of the Oil is accurately weighed and diluted with sufficient Alcohol (94·9 p.c.) to produce a solution, 50 c.c. of which shall represent 1 gramme of the Oil. A measured quantity of 5 c.c. of this solution is transferred to 100 c.c. measuring flask, and 30 c.c. of Tenth-normal Volumetric Silver Nitrate Solution and 5 c.c. of Ammonia Solution added. After well stoppering the flask the mixture is set aside in a dark place for 24 hours; then heated in a water-bath at a temperature of 80° C. (176° F.) for half an hour, with frequent intervals of shaking, the contents of the flask are diluted to the 100 c.c. mark and filtered. A measured quantity of 50 c.c. of the filtrate is mixed with 4 c.c. of Nitric Acid and a few drops of Ferric Ammonium Sulphate T.S. and sufficient Tenth-normal Volumetric Potassium Sulphocyanate Solution to produce a permanent red colour is added; not more than 5·6 c.c. of such solution should be required. Each c.c. of Tenth-normal Volumetric Silver Nitrate Solution absorbed corresponds to 0·00492 gramme of Allyl Iso-thiocyanate. The *P.G* process is essentially as follows:—A measured quantity of 5 c.c. of a 1 in 50 w/w solution of the Oil in Alcohol (90 p.c.) is transferred to a 100 c.c. stoppered measuring flask, 50 c.c. of Tenth-normal Volumetric Silver Nitrate Solution and 10 c.c. of Ammonia Solution added, and the flask is well stoppered and the mixture allowed to stand for 24 hours, with intervals of vigorous shaking. It is then diluted with Water to the 100 c.c. mark. A measured quantity of 50 c.c. of the clear filtrate is mixed with 6 c.c. of Nitric Acid and 1 c.c. of Ferric Ammonium Sulphate Solution, and sufficient Tenth-normal Volumetric Ammonium Rhodanate Solution added to produce a red coloration; from 16·6 to 17·2 c.c. shall be required, *P.G.*

Owing to the results yielded by the *P.G.* method being invariably too low, the following modifications of the *P.G.* method are suggested by Schimmel in the *Berichte* for April 1908:—A measured quantity of 5 c.c. of a 1–50 solution of the Oil in Alcohol (90 p.c.) is mixed in a 100 c.c. stoppered measuring flask with 10 c.c. of Ammonia Solution and 50 c.c. of Tenth-normal Volumetric Silver Nitrate Solution, and after closing the flask with a cork provided with a reflux tube 1 metre long it is heated for about 1 hour on a water-bath which is kept vigorously boiling. After cooling to 15° C. (59° F.) and diluting with Distilled Water to the mark, it is filtered, a measured quantity of 50 c.c. of the clear filtrate, after addition of sufficient Nitric Acid to produce a faintly acid reaction, is titrated with Tenth-normal Volumetric Ammonium Rhodanate Solution until the appearance of a red colour, 1 c.c. of Ferric Ammonium Sulphate Solution being added as an indicator; from 16·6 to 17·2 c.c. of the solution should be necessary. The *P.G.* figures require that it shall contain from 92·4 to 99·0 p.c., calculated as Allyl Iso-thiocyanate. It is preferably determined by the above process.

The more generally occurring impurities are Ethyl Alcohol, Petroleum, Chloroform, fatty oils, Carbon Bisulphide, Phenols. The requirement that the Oil shall distil between 147·2° and 152·2° C. (297° and 306° F.), and that the first and last portions of the distillate should have the same sp. gr. as the original Oil, precludes the presence of Ethyl Alcohol, Petroleum, Chloroform, fatty oils and Carbon Bisulphide. For the actual determination of Carbon Bisulphide, Schimmel recommends the following process:—A weighed quantity of 20 to 25 grammes of the Oil are heated on a water-bath while a slow current of air is passed through the Oil, the vapour of Carbon Bisulphide which is thus carried off is cooled by passing through a condenser and conducted into an alcoholic Potassium Hydroxide Solution, where it is converted into Potassium Ethyl Xanthate. After the neutralisation of the alkali solution, sufficient Tenth-normal Volumetric Copper Sulphate Solution is added until a drop produces a reddish-brown colour with Potassium Ferrocyanide. From the amount of Copper Solution consumed the percentage of Carbon Bisulphide present can be ascertained. 1 c.c. of Tenth-normal Volumetric Copper Sulphate Solution corresponds to 0·0152 gramme of Carbon Bisulphide. The volumetric process may be supplemented by a gravimetric one, the precipitate of Cuprous Ethyl Xanthate may be collected on a filter, washed, dried and heated to a red heat in a crucible and the residue of Cupric Oxide weighed. 1 gramme of the Oxide corresponds to 1·198 grammes of Carbon Bisulphide. Phenols, if present, may be detected by the test with Ferric Chloride T.S. described above.

Not Official.

APPLICATIO SINAPIS.—Volatile Oil of Mustard, 4 minims; Eau de Cologne, 1 fl. oz. Mix.

A good application in acute catarrh of the middle ear; to be applied behind the ear by means of a brush or absorbent Wool.

CATAPLASMA SINAPIS.—Mustard, in powder, 2½ oz. or *q.s.*; Linseed Meal, 2½ oz.; boiling Water and Water, of each a sufficiency.—*B.P.* '85.

Mix the Mustard with 2 or 3 oz. of lukewarm Water, mix the Linseed Meal with 6 to 8 oz. of boiling Water, add the former to the latter and stir together.

Crushed Linseed, 28; Mustard, 2; Water, *q.s.* to make 100.—*B.P.C.*

This is similar to the following:—

Make a Linseed Poultice by adding 4 parts of crushed Linseed to 10 parts of boiling Water, and for every 4 oz. of crushed Linseed employed add ¼ oz. of Mustard, previously rubbed to a smooth paste with a little cold or tepid Water.—*St. Thomas's.*

INFUSUM SINAPIS.—Mustard, 2 drm.; boiling Water, 4 fl. oz.; strain. It relieves obstinate hiccough.

THIOSINAMIN (Allyl-thio-carbamide).—White, glistening crystals, generally odourless, but sometimes possessing a faint, garlic odour; soluble 1 in 17 of Water, 1 in 2 of Alcohol (90 p.c.) and soluble in Ether. It has been found useful for softening scar tissues and the removal of fibrous stricture of the œsophagus, etc., and has also been used in the treatment of lupus.

Employed in the form of a 15 to 20 p.c. alcoholic solution, ½ to 1 syringeful being injected between the scapulæ; or as an 8 p.c. solution in Water containing 20 p.c. Glycerin, 20 minims being injected, in divided portions, in the neighbourhood of the growth.—*B.M.J.E.* '02, i. 91; '04, i. 75; *B.M.J.* '03, i. 656; *L.* '03, i. 785; *C.D.* '02, i. 538; *P.J.* '02, ii. 201.

Fibrolysin.—In arthritis deformans with contractures, and in old-standing urethral stricture.—*Pr.* '07, i. 427. Successful in treating gastric adhesions.—*F.T.* '07, 88.

In perigastric adhesions, pyloric stricture, hourglass stomach, and conditions in which there is new formation of connective tissue, it may be given (*B.M.J.* '05, ii. 811) hypodermically in the form of a 10 p.c. solution with 70 parts of Water and 20 parts of Alcohol. It has been successfully used (*B.M.J.* '06, i. 379) in the treatment of hypertrophy of the pylorus. 10 minims of a 10 p.c. solution in Alcohol injected daily for 1 week, then every other day for 14 days, then 3 times a week for 6 weeks, then twice a week for a month, and then 15 minims once a week for another 3 months.

SODIUM.

SODIUM.

Na, eq. 22·88.

A light, soft metal, exhibiting a silvery metallic lustre when freshly cut, but which rapidly oxidises in contact with air. It should be preserved under mineral Naphtha in well-stoppered glass bottles.

Metallic Sodium is not official in either the *U.S.P.* or the *P.G.*

The only direct official preparation of Sodium is **Liquor Sodii Ethylatis.** *See* SODII ETHYLATIS LIQUOR, p. 1115.

Tests.—Sodium has a sp. gr. of 0·97. It possesses a strong affinity for Oxygen and rapidly oxidises in the air when cut. When thrown on to cold Water it instantly fuses to a globule without combustion and traverses the surface in all directions; when thrown on to hot Water, however, or if its movements be circumscribed, combustion of the evolved Hydrogen ensues. The Water acquires an alkaline reaction towards red Litmus paper. It is officially mentioned that Water and Alcohol (90 p.c.) are vigorously attacked by it, Hydrogen being simultaneously evolved; the metal is almost entirely dissolved, leaving little or no insoluble residue. It is required to indicate at least 97·46 p.c. of metallic Sodium as determined by very cautiously adding 1 gramme of Water, and titrating the resulting solution with Normal Volumetric Sulphuric Acid Solution; at least 42·6 c.c. are officially required for neutralisation. The *B.P.* does not mention which indicator of neutrality should be used, but Phenolphthalein Solution may be most conveniently employed. When evaporated to dryness, the residue yields a brilliant yellow coloration when moistened with Hydrochloric Acid and introduced on a platinum wire into a non-luminous flame.

Not Official.

SODA CAUSTICA.

White, hygroscopic pencils, or sticks, possessing a crystalline structure, or as a white, crystalline, deliquescent powder, or in fused masses. It should be kept in well-closed hard glass bottles and exposed as little as possible to the air, as it readily absorbs moisture and Carbonic Anhydride from the air. It is necessary when handling it to exercise very great caution, as it has a strong action on the skin, and the dust from the powder is very irritating to the eyes and nose. The *B.P.* does not state any requisite percentage of pure Sodium Hydroxide, the *U.S.P.* requires that it shall contain not less than 90 p.c. of pure anhydrous Sodium Hydroxide, and not more than 2 p.c. of other inorganic substances with the exception of Water; it is not official in the *P.G.* A purified Sodium Hydroxide and a pure Sodium Hydroxide are also official in the *B.P.* Appendix; the latter is only required in testing for traces of Aluminium. It is officially directed to be obtained by dissolving Sodium Hydroxide in Ethyl Alcohol, filtering the solution, evaporating to dryness in a silver dish, adding Distilled Water occasionally during evaporation.

Foreign Pharmacopœias.—Official in Austr. (Natrium hydroxydatum); Dan., Dutch and Swed. (Hydras Natricus); Ital. (Soda Caustica); Jap. (Natrum Causticum); Port. (Hydrato de Soda); Span. (Hidrato Sodico); Swiss (Natrium Hydricum); U.S. (Sodii Hydroxidum).

The Solution is official in Austr. (Natrium Hydroxydatum Solutum) (15 p.c.), sp. gr. 1·169 to 1·172; Dutch (Solutio Hydratis Natrici) (13½ p.c.), sp. gr. 1·155; Fr. (Soude Caustique Liquide) (about 30 p.c.), sp. gr. 1·332; Ger. (Liquor Natri Caustici) (15 p.c.), sp. gr. 1·168 to 1·172; Hung. (Natrium Hydroxydatum Solutum) (32 p.c.), sp. gr. 1·35; Port. (Hydrato de Soda Liquido), sp. gr. 1·33; Span. (Solucion de Sosa Caustica) (30 p.c.), sp. gr. 1·33; Swed. (Solutio Hydratis Natrici) (25 p.c.), sp. gr. 1·275 to 1·285; Swiss (Natrium Hydricum Solutum) (30 p.c.), sp. gr. 1·33; U.S. (Liquor Sodii Hydroxidi) (about 5 p.c.), sp. gr. 1·056 at 25° C. (77° F.).

Antidotes.—Same as Liquor Potassæ, p. 930.

Pasta Londinensis.—Caustic Soda, Unslaked Lime, equal parts, reduced to a fine powder, and kept in a well-closed bottle. To be made into a paste with Water when required.

Tests.—Sodium Hydroxide dissolves readily and completely in Water, the solution even when very highly diluted has a strong alkaline reaction towards red Litmus paper. Sodium Hydroxide may be readily determined by direct titration with Normal Volumetric Sulphuric Acid Solution, using Phenolphthalein Solution as an indicator of neutrality. The quantity of Carbonate present in commercial samples is scarcely sufficient to vitiate the results when working on the small quantities required for that titration. When Methyl Orange Solution is employed as an indicator of neutrality, the Carbonate present is also estimated. 1 c.c. of Normal Volumetric Sulphuric Acid Solution is equivalent to 0·03976 gramme of pure anhydrous Sodium Hydroxide. The *B.P.* gives no requisite percentage of Sodium Hydroxide. The *U.S.P.* requires that it shall contain not less than 90 p.c. of pure anhydrous Sodium Hydroxide, as determined by introducing about 1 gramme of the salt into a stoppered weighing bottle and accurately ascertaining its weight, dissolving in about 50 c.c. of Water, and titrating the Solution with Normal Volumetric Sulphuric Acid Solution, using Methyl Orange Solution as an indicator of neutrality, the number of c.c. of Normal Volumetric Sulphuric Acid Solution required multiplied by 3·976, the product divided by the weight of Sodium Hydroxide taken, the quotient represents the percentage of pure anhydrous Sodium Hydroxide present. When neutralised with Hydrochloric Acid, the product when introduced on a platinum wire into the non-luminous flame affords a brilliant yellow coloration. The *U.S.P.* states that when heated to about 525° C. (977° F.) it melts to a clear oily liquid and is slowly volatilised unchanged at a bright red heat.

The more generally occurring impurities are organic matter, and insoluble impurities, heavy metals such as Arsenic, Copper, Lead, Iron and Zinc, Potassium Carbonate, Silicate, Chlorides and Sulphates. The 1 in 20 aqueous solution should be perfectly clear and colourless, indicating the absence of organic matter and insoluble impurities. When acidulated with Hydrochloric Acid it should yield no coloration or precipitate with Hydrogen Sulphide, nor should any coloration or precipitate ensue upon the subsequent addition of Ammonia Solution, indicating the absence of heavy metals. A 5 p.c. aqueous solution after acidification with Acetic Acid should yield no precipitate on the addition of Tartaric Acid, indicating the absence of Potassium. It should not yield more than a faint effervescence when a slight excess of diluted Sulphuric Acid is added to 10 c.c. of a 10 p.c. solution, indicating the limit of Carbonate. When 0·7 of a gramme of Sodium Hydroxide is dissolved in 1·5 c.c. of Water, this solution should not yield more than a slight white precipitate, within 10 minutes, when added to 10 c.c. of Alcohol (94·9 p.c.) indicating a limit of Silicate. A 5 p.c. solution when acidified with Nitric Acid should not yield more than a faint turbidity with Silver Nitrate or Barium Chloride Solution, indicating the absence of more than traces of Chlorides and Sulphates. The *B.P.* includes also Aluminium and and Phosphates as likely impurities. Aluminium, if present, may be detected by neutralising the Hydroxide with Hydrochloric Acid, adding Ammonium Chloride and Ammonia Solution and boiling, no white flocculent precipitate should be produced. A 5 p.c. aqueous solution should not afford a yellow precipitate when acidified with Nitric Acid and warmed with Ammonium Molybdate T.S., indicating the absence of Phosphates. The purified Sodium Hydroxide of the *B.P.* is required to yield no characteristic reactions with the tests for Phosphates or Sulphates, and not more than the slightest reactions with the tests for Carbonates, but need not necessarily be quite free from Alumina.

LIQUOR SODII HYDROXIDI.—Solution of Sodium Hydroxide. Purified Sodium Hydroxide, 200 grammes; Distilled Water, sufficient to produce 1000 c.c. The purified Sodium Hydroxide is dissolved in a portion of the Distilled Water, the solution made up to 1000 c.c. and filtered.

Tests.—Solution of Caustic Soda *B.P.* has a sp. gr. of about 1·175. It contains about 18·0 p.c. of pure anhydrous Sodium Hydroxide, as determined by titrating a measured quantity of the Liquor with Normal Volumetric Acid Solution, using Phenolphthalein Solution as an indicator of neutrality. The *B.P.* does not mention any requisite percentage, the *U.S.P.* Liquor has a sp. gr. of about 1·056 at 25° C. (77° F.) and is required to contain about 5 p.c. of pure anhydrous Sodium Hydroxide. About 25 c.c. of Normal Volumetric Sulphuric Acid Solution are stated to be necessary to neutralise 20 c.c. (19·9 grammes) of the solution, using Methyl Orange T.S. as an indicator of neutrality. 1 c.c of Normal Volumetric Sulphuric Acid indicates 0·2 p.c. of absolute Sodium Hydroxide. The *P.G.* Liquor has a sp. gr. of 1·168 to 1·172, it is required to contain about 15 p.c. w/w of absolute Sodium Hydroxide. The *B.P.* solution naturally should be free from such impurities as are precluded from Sodium Hydroxide or purified Sodium Hydroxide. The *U.S.P.* Liquor is required to answer the same reactions and tests as an aqueous solution of Sodium Hydroxide. The *P.G.* Liquor is required to be free from Carbonates, to contain only traces of Chlorides and Sulphates, to be free from Nitrates, and to contain only traces of Aluminium.

SODA TARTARATA.

SODIUM POTASSIUM TARTRATE.

B.P.Syn.—Tartarated Soda; Tartrate of Potassium and Sodium; Rochelle Salt. *N.O. Syn.*—Tartarus Natronatus; Sal Polychrestum Seignette.

$KNaC_4H_4O_6, 4H_2O$, eq. 280·15.

Fr., Tartrate Droit de Sodium et de Potassium; Ger., Kaliumnatriumtartrat; Ital., Tartrato Sodico-Potassico; Span., Tartrato Sodico-Potasico.

Colourless, translucent, rhombic prisms, or a white, odourless powder, having a saline taste. It is prepared by neutralising the acid radicle of Acid Potassium Tartrate with Sodium Carbonate and recrystallisation.

It should be kept in well-closed vessels and exposed as little as possible to the air, as it has a slight tendency to effloresce.

Solubility.—1 in 1½ of Water; soluble in its own Water of crystallisation when hot; insoluble in Alcohol (90 p.c.).

Medicinal Properties.—A mild purgative, well suited for constipation associated with gout and hepatic dyspepsia. It is not aperient in small doses, its action then being diuretic, antilithic, and to render the urine alkaline.

Dose.—120 to 240 grains = 8 to 16 grammes.

Official Preparation.—Pulvis Sodæ Tartaratæ Effervescens.

Foreign Pharmacopœias.—Official in Austr. and Hung. (Kalium Natrio-tartaricum); Belg. (Kalium Natrium Tartaricum); Dan., Norw. and Swed. (Tartras Natrico-kalicus); Dutch (Tartras Kalico-natricus); Fr. (Tartrate Droit de Potassium et de Sodium); Ger. and Swiss (Tartarus Natronatus); Ital. (Tartrato Sodico-Potassico); Jap. and Russ. (Natrio-Kalium Tartaricum); Mex. (Tartrato de Potasio y Sodio); Port. (Tartrato de Potassæ de Soda); Span. (Tartrato Sodico-Potasico); U.S. (Potassii et Sodii Tartras).

Tests.—Tartarated Soda when heated fuses to a more or less colourless liquid and loses its Water of crystallisation, equivalent to 25·5 p.c. At a higher temperature it gradually becomes brown, and when still more strongly heated evolves an odour of burnt Sugar and leaves a black residue possessing a strong alkaline reaction. It dissolves readily in Water, forming a colourless solution possessing a faintly alkaline reaction towards Litmus paper. The *P.G.* states that it is neutral towards Litmus paper. The *U.S.P.* states that the aqueous solution does not effect Phenolphthalein Solution. The *B.P.* makes no mention of its reaction towards any indicator of neutrality. When incinerated and the residue is dissolved in diluted Hydrochloric Acid it yields a solution which answers the distinctive tests of Potassium and Sodium given under those headings. The aqueous solution affords, with Calcium Chloride Solution, a white granular precipitate soluble in a cold, moderately concentrated Potassium Hydroxide Solution, being again reprecipitated on boiling; with Silver Nitrate Solution it yields a white precipitate soluble in Nitric Acid and in

Ammonia Solution, and if just sufficient Ammonia Solution be added the precipitate redissolves and the mixture yields on boiling in a perfectly clean test-tube a mirror of metallic Silver. When a moderately concentrated solution of the salt is acidulated with Acetic Acid and mixed with a concentrated Potassium Acetate Solution it affords, when well stirred, a white precipitate, the precipitation being more pronounced on the addition of Alcohol (90 p.c.). When acidified with Acetic Acid it yields, on the addition of a drop of Ferrous Sulphate Solution, a few drops of Hydrogen Peroxide Solution and an excess of Potassium Hydroxide Solution, a purple or violet coloration. It is officially required to contain 98·0 p.c. of pure crystallised Sodium Potassium Tartrate, as volumetrically determined by the method given below under Volumetric Determination. The *U.S.P.* requires the salt to contain not less than 99 p.c. of pure Potassium and Sodium Tartrate, the process of determination being also a volumetric one and appearing below. The *P.G.* does not include a method of determination, nor does it state the amount of pure salt which it is requisite for a specimen to contain. As regards impurities, the *B.P.* does not mention any substances as likely impurities; the more generally occurring are Lead, Copper, Iron, Ammonium salts, Calcium, Sulphates and Chlorides. Lead, Copper and Iron may be detected by the Hydrogen Sulphide test, Ammonium salts by the Potassium or Sodium Hydroxide test, Calcium by the Ammonium Oxalate test, Sulphates and Chlorides by the Barium Nitrate and Silver Nitrate test described below. The absence of tests for impurities has apparently escaped the notice of those responsible for the *Report of the Committee of Reference in Pharmacy*, as no recommendation for their inclusion appears, and a limit of Lead as an impurity should have been included, not only in the present instance, but in the case of all Tartrates and Citrates. Standards have been suggested (*C.D.* '08, i. 796) of 10 parts per million for Lead, and 2 parts per million for Arsenic. A suitable limit for Lead in Tartaric Acid has been suggested as 10 in 1,000,000, *see* Tartaric Acid.

Hydrogen Sulphide.—The aqueous solution (1-20) of the salt should not be affected by T.S. of Hydrogen Sulphide, *P.G.*; slightly acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Potassium or Sodium Hydroxide.—When heated with Sodium Hydroxide T.S. it should not evolve Ammonia, *P.G.* The *U.S.P.* uses Potassium Hydroxide T.S.

Barium Nitrate.—An aqueous solution (1-20) after the addition of Nitric Acid and the removal of the crystalline precipitate should not be affected by T.S. of Barium Nitrate, *P.G.*

Silver Nitrate.—An aqueous solution (1-20) of the salt after treatment as in previous test should not be rendered more than opalescent by T.S. of Silver Nitrate, *P.G.*

Ammonium Oxalate.—If 1 gramme of the salt be dissolved in 10 c.c. of Water and shaken with 5 c.c. of diluted Acetic Acid, the liquid poured off from the crystalline precipitate which separates out and diluted with an equal part of Water should not be affected within 1 minute by 8 drops of T.S. of Ammonium Oxalate, *P.G.*

Volumetric Determination.—If 1 gramme of the salt be thoroughly ignited at red heat, and the residue extracted with boiling Distilled Water until the washings cease to react with Methyl Orange T.S., the mixed filtrate and washings should require for complete neutralisation not less than 14·1 c.c. of Semi-normal Volumetric Solution of Hydrochloric Acid, Methyl Orange T.S. being used as indicator, *U.S.P.*

The residue from the ignition of 1 gramme of the salt dissolved in Water, should require for exact neutralisation not less than 7 c.c. of Volumetric Solution of Sulphuric Acid, *B.P.*

Preparation.

PULVIS SODÆ TARTARATÆ EFFERVESCENS. Effervescent Tartarated Soda Powder. Commonly known as Seidlitz Powder. *N.O.Syn.*—Pulvis Aerophorus Laxans; Pulvis Effervescens Laxans.

Sodium Potassium Tartrate, in dry powder, 120 grains; Sodium Bicarbonate, in dry powder, 40 grains. Mix. Wrap in blue paper. Tartaric Acid, in dry powder, 38 grains. Wrap in white paper.

Dose.—The quantities given above are intended for one dose. The powder in blue paper is first dissolved in about half a pint of Water, and the powder in white paper added to it and the whole taken during effervescence.

The chief Continental Pharmacopœias have a simple Effervescent Powder, made with Sodium Bicarbonate and Tartaric Acid, and also a compound powder containing similar ingredients to the above.

Official in all the Foreign Pharmacopœias except Fr. and Ital.

Fr. has Eau Saline Purgative gazeuse (Eau dite de Seidlitz), *see* p. 755.

Not Official.

SODII ACETAS.

SODIUM ACETATE.

$NaC_2H_3O_2 \cdot 3H_2O$, eq. 135·10.

Fr., Acétate de Sodium; Ger., Natriumacetat; Ital., Acetato di Sodio; Span., Acetato Sodìco.

Colourless, translucent, monoclinic prisms, or as a white, granular, crystalline powder, possessing a saline, bitter taste. The crystals are efflorescent in warm air, and should be kept in well-closed bottles in a cool place.

Sodium Acetate is not official in the *B.P.*, but is official in both the *U.S.P.* and the *P.G.*

Solubility.—1 in 1 of Water; 1 in 30 of Alcohol (90 p.c.).

It has been employed as a diuretic in place of the Potassium salt, but is rarely used medicinally. Used in the preparation of Acetic Ether.

Foreign Pharmacopœias. Official in Fr., Ger., Hung., Ital., Jap., Mex., Russ., Swed., Swiss and U.S.

Tests.—Sodium Acetate liquefies when heated and loses its Water of crystallisation, equivalent to 39·7 p.c. The *U.S.P.* gives the liquefying point at 60° C. (140° F.), and states that at 123° C. (253·4° F.) it becomes dry and anhydrous. When still more strongly heated it is decomposed, evolving empyreumatic vapours and leaving a black residue, which when dissolved in Water possesses a strong alkaline reaction towards red Litmus paper, and which effervesces on the addition of diluted acid. The salt dissolves readily in Water, forming a colourless solution which is alkaline in reaction towards red Litmus paper, but which produces little or no coloration with Phenolphthalein Solution. The solution answers the tests distinctive of Sodium given under that heading, and the addition of Ferric Chloride T.S. produces a deep red coloration, the solution on boiling yielding a brown flocculent precipitate of basic Ferric Acetate. When warmed with Sulphuric Acid it evolves a strong acetous odour, and when warmed with Sulphuric Acid and a small quantity of Alcohol (90 p.c.) it yields the characteristic odour of Ethyl Acetate (Acetic Ether); a minute quantity of the anhydrous salt when heated with a correspondingly minute quantity of Arsenious Anhydride yields a characteristic and highly poisonous odour of Cacodyl Oxide. The *U.S.P.* requires it to contain at least 99·5 p.c. of pure Sodium Acetate as volumetrically determined by the process described below. The *P.G.* does not state what percentage of pure Sodium Acetate the salt should contain, nor does it give a method of determination.

The more generally occuring impurities are Arsenic, Lead, Copper, Iron and Zinc, Calcium, Potassium, Chlorides and Sulphates. Arsenic, if present, may be detected by the modified Gutzeit's test, Lead, Copper, Iron and Zinc, if present, may be detected by Hydrogen Sulphide, either in a solution rendered faintly acid by diluted Hydrochloric Acid, or in a solution rendered alkaline with Ammonia. Calcium, if present, by the addition of Ammonium Oxalate Solution to an aqueous solution of the salt; Potassium, if present, by the turbidity produced on the addition of Sodium Bitartrate T.S. to a saturated aqueous solution of the salt. A 10 p.c. aqueous solution should not be rendered turbid by the addition of Barium Nitrate Solution, nor when acidified with Nitric Acid by Silver Nitrate Solution. The *P.G.* includes a separate test for the presence of Iron, requiring that 20 c.c. of a 1–20 aqueous solution should not assume a blue coloration on the addition of 0·5 c.c. of Potassium Ferrocyanide Solution (1–20).

Volumetric Determination.—A weighed quantity of 1 gramme of the salt is thoroughly carbonised at a temperature not exceeding a red heat, the residue is treated with boiling Water, the solution filtered, and the extraction of the residue continued with boiling Distilled Water until the washings no longer produce an alkaline reaction with Methyl Orange T.S. The mixed filtrate and washings should require for complete neutralisation not less than 14·7 (14·74) c.c. of Semi-normal Volumetric Sulphuric Acid Solution, Methyl Orange T.S. being employed as an indicator of neutrality, *U.S.P.*

SODII THEOBROMINÆ ACETAS (Agurin) $C_7H_7N_4O_2Na\ C_2H_3O_2Na$, eq. 282·13.—A white, crystalline powder, possessing a somewhat bitter, saline taste. It is soluble in Water. Introduced as a diuretic.

It should be kept in well-closed glass bottles and protected as far as possible from exposure to the air, as it has a tendency to absorb Carbonic Anhydride.

It contains theoretically 63·8 p.c. of pure Theobromine, and shows a Theobromine content 10 p.c. in excess of that contained in Theobromine Sodium Salicylate.

Dose.—3 to 8 grains = 0·2 to 0·52 gramme, given in form of a cachet, or a suspension with mucilage.

Tests.—Theobromine Sodium Acetate dissolves in Water, forming a solution which is slightly alkaline in reaction towards red Litmus paper. The aqueous solution when neutralised and diluted with Hydrochloric Acid throws down a precipitate of Theobromine, which dissolves when shaken with Chloroform. If the chloroformic solution be separated and a few drops be evaporated to dryness on a water-bath on a watch-glass, the residue when treated with Chlorine Water and again evaporated to dryness on the water-bath leaves a reddish-brown residue which, when moistened with Ammonia Solution, affords a purple-violet coloration. An aqueous solution of the salt affords with Ferric Chloride T.S. a deep red coloration, which when boiled affords a brownish-red precipitate of basic Ferric Acetate. When heated with a small quantity of Sulphuric Acid and a little Alcohol (90 p.c.) it evolves a characteristic odour of Ethyl Acetate (Acetic Ether); the salt should leave no weighable residue when ignited with free access of air.

SODII ARSENAS.

ARSENIATE OF SODIUM (HYDROUS), *B.P.* '85.

Na_2HAsO_4, eq. 184·78.

FR., ARSENIATE DE SODIUM OFFICINAL; GER., NATRIUMARSENIAT; ITAL., ARSENIATO BISODICO; SPAN., ARSENIATO SODICO.

The anhydrous salt, Di-sodium Hydrogen Arsenate.

An odourless, white, granular, amorphous powder.

It should be kept in well-stoppered glass bottles and protected as far as possible from exposure to a moist atmosphere.

The anhydrous salt, Di-sodium Hydrogen Arsenate, is official in the *B.P.*, and is officially directed to be prepared by dehydrating the crystallised Di-sodium Hydrogen Arsenate at a temperature of 148·9° C. (300° F.). Crystallised Di-sodium Hydrogen Arsenate is prepared by crystallising from Water the product resulting from the fusion of Arsenious Anhydride with a mixture of Sodium Nitrate and Sodium Carbonate. Sodium Arsenate (*U.S.P.*) is the Di-sodium-ortho-arsenate containing 7 molecules of Water of crystallisation. Exsiccated Sodium Arsenate (*U.S.P.*) is the anhydrous or almost anhydrous Di-sodium-ortho-arsenate. The salt is not official in the *P.G.* The *Brussels Conference* has adopted the crystallised salt containing 7 molecules of Water of crystallisation.

The crystallised salt occurs as colourless, odourless, translucent, prismatic crystals, with a slightly alkaline reaction, having the formula $Na_2HAsO_4 \cdot 7H_2O$, eq. 309·94. The *B.P.* title 'Arseniate of Sodium' (hydrous), *B.P.* '85, might very well have been omitted, as it is very misleading, and apt to give rise to serious error if the terms are taken to be synonymous. Some mention of the equivalents of the two salts might at least have been made under this heading 1 grain of the anhydrous salt = 1·67 grains of the crystallised ($7H_2O$) salt; *not* 1·77 grains as given in the *B.P.* monograph on Liquor Sodii Arsenatis.

Solubility.—1 in 4 of Water.

Medicinal Properties.—Similar to those of Liquor Arsenicalis. *See* ACIDUM ARSENIOSUM, p. 14.

Dose.—$\frac{1}{40}$ to $\frac{1}{10}$ grain = 0·0016 to 0·0065 gramme.

Ital. maximum single dose of the crystals ($7H_2O$), 0·004 gramme maximum daily dose, 0·015 gramme.

Prescribing Notes.—*Generally employed in the form of the* **Liquor**; *may also be given in* **pills** *well triturated with Milk Sugar and 'Diluted Glucose,' q.s.*

Official Preparation.—Liquor Sodii Arsenatis.

Antidotes.—*See* ACIDUM ARSENIOSUM, p. 15.

Foreign Pharmacopœias.—Official in Belg., dried salt; Dutch, Fr., Ital., Mex., Port., Span. and Swiss, crystallised; Ital. and U.S. both.

Tests.—Sodium Arsenate dissolves readily in Water, forming a solution which possesses an alkaline reaction toward red Litmus paper. It answers the tests distinctive of Sodium given under that heading. The 5 p.c. aqueous solution affords with Barium or Calcium Chloride Solutions a white precipitate soluble in Nitric Acid; with Silver Ammonio-Nitrate Solution a dark red precipitate soluble in Nitric Acid; with Magnesium Ammonio-Sulphate Solution a white crystalline precipitate soluble in a diluted mineral acid. It is officially required to contain 99·8 p.c. of pure anhydrous Sodium Arsenate, as gravimetrically determined by precipitating a solution of a weighed quantity of 1 gramme of the salt and 1 (presumably gramme) of Glacial Acetic Acid in 50 c.c. of Water with Lead Acetate; the *B.P.* mentions that such a solution should require 2·03 grammes of the Lead salt for complete precipitation. The Report of the Committee of Reference in Pharmacy states that the Lead Acetate test, which has been several times the subject of discussion, is substantially correct if carried out as described in an Acid solution. The official volume does not state whether the 1 of Glacial Acetic Acid is by weight or by measure. The *U.S.P.*, although requiring that the salt should contain not less than 98 p.c. of anhydrous Di-sodium-ortho-arsenate, does not describe a method of determination. A volumetric process would have been preferable. A convenient method has been suggested (*Y.B.P.* '02, 505), the process recommends titrating a weighed quantity of the salt with Normal Volumetric Sulphuric Acid, using Methyl Orange Solution as an indicator of neutrality. Owing to the high molecular equivalent of the salt a good quantity should be employed for the determination, not less than 3 grammes of the crystallised or its equivalent of the anhydrous salt has been suggested.

The more generally occurring impurities are Lead, Copper and Iron, Aluminium, Calcium, Carbonates, Chlorides, Nitrates and Sulphates, a certain amount of moisture may also be present. 5 c.c. of a 1 in 20 aqueous solution of the salt when mixed with 1 c.c. of Ammonium Sulphide T.S. should not afford a dark coloration, indicating the absence of Lead, Copper and Iron. The aqueous solution when boiled with Ammonia Solution should not afford a white flocculent precipitate, indicating the absence of Aluminium; the aqueous solution should not yield on the addition of Ammonium Oxalate a white cloudiness or turbidity, indicating the absence of Calcium. The salt should not effervesce on the addition of a diluted mineral acid, indicating the absence of Carbonates. The aqueous solution when rendered acid with Nitric Acid should yield no pronounced turbidity on the addition of Silver Nitrate Solution or Barium Chloride Solution, indicating the absence of more than traces of Chlorides and Sulphates. When an aqueous solution of the salt is treated with Sulphuric Acid, the mixture being kept cool, it should yield no brown ring at the point of junction of the two liquids when Ferrous Sulphate Solution is poured upon the surface, indicating the absence of Nitrates. Arsenite is sometimes present as an impurity, and may be detected by the Silver Nitrate test given below. The *B.P.* requires that it should not lose weight on being heated to 148·9° C. (300° F.), indicating the absence of Hydrous Sodium Arsenate. The *U.S.P.* requires that it should not lose weight when heated to 150° C. (302° F.); the *B.P.* includes tests for Magnesium, Potassium and Ammonium.

Silver Nitrate.—If to 2 c.c. of an aqueous solution (1 in 20), 5 c.c. of Tenth-normal Silver Nitrate Volumetric Solution be added, and the precipitate redissolved by a slight excess of Ammonia Water, no black precipitate of reduced Silver should appear on boiling (absence of Arsenite), *U.S.P.*

Preparation.

LIQUOR SODII ARSENATIS. Solution of Sodium Arsenate.
Sodium Arsenate, recently rendered anhydrous, 17½ grains;
Distilled Water, *q.s.* to yield 4 fl. oz. (1 in 100)

After being made, this solution deposits a little Silica introduced in the preparation of the Arsenate, but, if filtered after a few days, remains clear.

It is about half the strength of Liquor Arsenicalis in Arsenic, as that preparation contains 1 p.c. of Arsenious Acid, and this 1 p.c. of Sodium Arsenate; another difference is that Liquor Arsenicalis contains an Arsenite, and this an Arsenate.

Dose.—2 to 8 minims = 0·12 to 0·5 gramme.

11 minims contain $\frac{1}{10}$ grain of the anhydrous salt.

Ph. Ger. maximum single dose, 0·5 gramme; maximum daily dose, 1·5 grammes, of the Potassium Arsenite Solution.

Foreign Pharmacopœias.—Official in U.S., same as Brit., Dan., Port. and Swiss, 1 in 500; Ital. and Mex. have Solucion Arsenical de Pearson, 1 in 600.

Tests.—Solution of Sodium Arsenate has a sp. gr. of 1·010 to 1·015. It is officially required to contain 1 p.c. w/v of anhydrous Sodium Arsenate, but no method is given by which this requisite percentage may be ensured. The *U.S.P.* requires that it shall contain Sodium Arsenate corresponding in amount to not less than 1 p.c. of exsiccated Sodium Arsenate, but like the *B.P.* gives no method by which this proportion may be ensured. It should respond to the tests distinctive of Sodium Arsenate given under Sodii Arsenas, and should be free from the impurities there mentioned.

SODII BENZOAS.

SODIUM BENZOATE.

C_6H_5COONa, eq. 143·01.

Fr., Benzoate de Sodium; Ger., Natriumbenzoat; Ital., Benzoato di Sodio; Span., Benzoato Sodico.

A white, odourless, amorphous powder or having a faint odour of Benzoin when made from resin-sublimed Acid. It is obtained by neutralising Benzoic Acid with Sodium Carbonate.

The salt is official in the *U.S.P.*, but not in the *P.G.* The *U.S.P.* requires that it shall contain not less than 99 p.c. of pure Sodium Benzoate.

It should be kept in well-stoppered glass bottles and in a cool atmosphere.

Solubility.—1 in 2 of Water; 1 in 25 of Alcohol (90 p.c.).

Medicinal Properties.—Similar to Benzoic Acid, but less irritating; given in chronic cystitis in which there is alkaline and decomposing urine.

The Royal College of Physicians of London recommended a solution of 120 grains in a quart of hot Water injected into the bowel in cholera; if much pain, 15 to 30 minims of Laudanum may be added.—*L.* '92, ii, 683.

Dose.—5 to 30 grains = 0·32 to 2 grammes.

Prescribing Notes.—*May be given in* **cachets** *but generally employed in* **solution.**

Incompatibles.—Ferric Salts, Citric and Tartaric Acids, and Mineral Acids.

Foreign Pharmacopœias.—Official in all except Dan., Ger., Norw. and Swed. Dutch has also Benzoas Natricus cum Coffeino, Sodium Benzoate and Caffeine equal parts.

Tests.—Sodium Benzoate when heated melts, evolving an odour of Benzoic Acid, finally charring when strongly heated and leaving a residue which, when dissolved in Water, yields a solution having a strongly alkaline reaction towards red Litmus paper. The salt dissolves readily in Water, forming a colourless solution which possesses a faintly alkaline reaction towards red Litmus paper. The *U.S.P.* states that the aqueous solution is neutral or slightly alkaline towards Litmus paper. After separation of the Benzoic Acid it answers the tests distinctive of Sodium given under that heading. The aqueous solution of the salt affords with Ferric Chloride T.S. a buff coloured precipitate. A concentrated aqueous solution of the salt yields on the addition of sufficient Diluted Sulphuric Acid a bulky white crystalline precipitate, which when separated, washed till free from mineral acid and carefully dried should possess the m.p. and answer the tests distinctive of Benzoic Acid described under Acidum Benzoicum. It is officially required to yield from 97·2 to 98·7 p.c. of pure Sodium Benzoate as volumetrically determined by the process described below under the heading of Volumetric Determination. Three commercial samples contained an average of 4 p.c. of Water, which the volumetric test requiring 97 p.c. of anhydrous Sodium Benzoate does not recognise. The *U.S.P.* requires that it should contain not less than 99 p.c. of pure Sodium Benzoate as volumetrically determined by the process also mentioned in small type. It may be noticed that the Pharmacopœia leaves the choice of indicator to the operator. The *U.S.P.* states that Methyl Orange T.S. should be used as an indicator of neutrality. In carrying out the Pharmacopœia process of igniting a gramme of the salt, it will be found that considerable difficulty is experienced in burning off the carbonaceous matter, and the result is liable to be below the truth, owing to loss or incomplete washing of the partially incinerated residue. The method of direct titration similar to that given under Lithii Benzoas may be employed. 1 c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution is equivalent to 0·014301 gramme of Sodium Benzoate.

The more generally occurring impurities are heavy metals, Lead, Copper and Iron, Calcium, Ammonium, Carbonates, Chlorides or Sulphates. If the aqueous solution of the salt be slightly acidified with Diluted Hydrochloric Acid, and if the precipitated Benzoic Acid be separated by filtration, the filtrate should yield no darkening in colour when tested with Hydrogen Sulphide, either in the acidified filtrate as it stands, or after being rendered alkaline by the addition of Ammonia Solution, indicating the absence of Lead, Copper and Iron. The aqueous solution should afford no opalescence on the addition of Ammonium Oxalate Solution, indicating the absence of Calcium. When boiled with Potassium or Sodium Hydroxide Solution it shall not yield an ammoniacal odour, nor shall the issuing vapour possess an alkaline reaction towards moistened red Litmus paper, indicating the absence of Ammonium salts. The aqueous solution should not yield an effervescence on the addition of Diluted Sulphuric Acid, indicating the absence of Carbonate. If the aqueous solution be acidified with diluted Nitric Acid and filtered from the precipitate of Benzoic Acid, the filtrate should yield only the faintest turbidity with Silver Nitrate or Barium Chloride Solutions, indicating the absence of more than traces of Chlorides and Sulphates. The *B.P.* also includes tests for Magnesium and Potassium.

Volumetric Determination.—If 1 gramme of the dry salt be thoroughly ignited at red heat, and the residue extracted with boiling Distilled Water, until the washings cease to react with Methyl Orange T.S., the mixed filtrate and washings should require for complete neutralisation not less than 13·85 c.c. of Semi-normal Hydrochloric Acid Volumetric Solution, Methyl Orange T.S. being used as indicator, *U.S.P.*

The residue from the ignition of 1 gramme of the salt, when dissolved in Water should require for neutralisation 6·8 to 6·9 c.c. of the Volumetric Solution of Sulphuric Acid, *B.P.*

SODII BICARBONAS.

SODIUM BICARBONATE.

$NaHCO_3$, eq. 83·43.

FR., CARBONATE ACIDE DE SODIUM; GER., NATRIUMBICARBONAT; ITAL., BICARBONATO DI SODIO; SPAN., BICARBONATO SODICO.

Small, opaque, prismatic crystals, or an odourless, white, microcrystalline powder, possessing a saline taste and alkaline reaction.

It should be kept in well-closed vessels and in a cool atmosphere.

Solubility.—1 in 12 of Water; insoluble in Alcohol (90 p.c.).

Medicinal Properties.—Analogous to those of Potassium Bicarbonate; but it is much more frequently given, as it is only feebly depressant and is more slowly absorbed than the Potassium salt. Employed as a gastric sedative half an hour before food; and as an antacid in preventing the eructations and pain of hyperacidity half an hour after food. In the Uric Acid diathesis the corresponding salts of Potassium and Lithium are preferable, as they form more soluble salts with Uric Acid. Very large doses are given in the acid intoxication and coma of diabetes. Moistened with Water, it is an excellent application to the stings of wasps and gnats; a lotion relieves itching.

Alkalis are beneficial in dyspepsia when given half an hour before food, not, as is sometimes taught, by increasing gastric secretion, but by inhibiting it, and so for the time being resting the stomach.—(W. E. Dixon) *B.M.J.* '06, ii. 1459. Large doses the most successful treatment of acetonuria.—*L.* '07, i. 511.

Sodium salts accelerate the conversion of gelatinous Sodium Bi-urate into the crystalline variety, and their employment in the treatment of gout is apparently not desirable.—*L.* '00, i. 931; *B.M.J.* '00, i. 836.

5 cachets daily, each cachet containing 30 grains, increasing the dose if necessary, in the vomiting of pregnancy.—*Pr.* lxvii. 244.

Large doses (100 to 125 grains in 24 hours) in recurring vomiting of infancy. —*M.A.* '04, 379.

A sterile solution injected through a Eustachian catheter is probably the most efficacious treatment of non-suppurative middle-ear disease.—*B.M.J.* '04, ii. 1206.

120 to 180 grains per day in the recurrent vomiting of childhood.—*B.M.J.* '04, ii. 350, 351.

Dose.—5 to 30 grains = 0·32 to 2 grammes.

Prescribing Notes.—*May be prescribed in* **cachets, powders,** *or in* **solution.** *It is also given in Compressed Tablets.*

20 of Sodium Bicarbonate are neutralised by 16·7 *of Citric Acid, and by* 17·8 *of Tartaric Acid.*

Official Preparation.—Trochiscus Sodii Bicarbonatis. Used in the preparation of Caffeinæ Citras Effervescens, Ferri Arsenas, Ferri Phosphas, Lithii Citras Effervescens, Magnesii Sulphas Effervescens, Pulvis Sodæ Tartaratæ Effervescens, Sodii Citro-Tartras Effervescens, Sodii Phosphas Effervescens, Sodii Sulphas Effervescens, Spiritus Ætheris Compositus, and 'Soluble Saccharin.'

Not Official.—Sal Emsanum Facticium, Trochisci Bicarbonatis Natrici Compositi, Collunarium Alkalinum, Collunarium Alkalinum Co., Mistura Sodæ Composita, Nebula Alkalina, and Nebula Alkalina Composita.

Foreign Pharmacopœias.—Official in all.

Tests.—Sodium Bicarbonate yields the tests distinctive of Sodium given under that heading. When heated it loses Carbon Dioxide and Water, being converted into Sodium Carbonate. It loses at a temperature of 100° C. (212° F.) (according to the *U.S.P.*) about 36·5 p.c. of its weight. According to the *P.G.*, 100 parts of the salt previously dried over Sulphuric Acid shall leave, after ignition at a dull red heat, not more than 63·8 parts by weight of residue, corresponding to a loss of not less than 36·2 p.c. It effervesces strongly on the addition of a diluted mineral acid, yielding a colourless and odourless gas which, when passed into Lime Water, yields a white precipitate soluble in a sufficient excess of the gas or in diluted mineral acids. The salt is soluble in Water, forming a colourless solution which is alkaline in reaction towards red Litmus paper; it yields no precipitate with Magnesium Sulphate Solution. It is officially required to indicate 98·4 to 99·3 p.c. of pure Sodium Bicarbonate as volumetrically determined by titrating 1 gramme of the salt with Volumetric Sulphuric Acid Solution, from 11·8 to 11·9 c.c. should be necessary; the choice of an indicator of neutrality is left to the operator. The *U.S.P.* requires that it should contain not less than 99 p.c. of pure Sodium Bicarbonate as volumetrically determined by titrating 2 grammes of the salt with Normal Volumetric Sulphuric Acid Solution, by the method indicated in small type below under the heading of Volumetric Determination. The *U.S.P.* directs the use of Methyl Orange Solution as an indicator of neutrality.

The more generally occurring impurities are Lead, Copper, Iron, Aluminium, Calcium, Ammonium, Chlorides, Sulphates, Thiocyanates, and Sodium Carbonate. The solution of the salt should afford no darkening in colour, either in acid or in alkaline solution, on the addition of Hydrogen Sulphide, indicating the absence of Copper, Lead, and Iron. Standards have been suggested (*C.D.* '08, i. 796) of 5 parts per million for Lead, and 2 parts per million for Arsenic. A standard suggested for Chloride is 0·1 p.c., calculated as Sodium Chloride. When dissolved in diluted Hydrochloric Acid, Ammonium Chloride added, and Ammonia Solution in faint excess, it shall yield no flocculent precipitate, indicating the absence of Aluminium. It should yield no opalescence on the addition of Ammonium Oxalate Solution to an aqueous solution slightly acidified with Acetic Acid, indicating the absence of Calcium. When heated in a dry test-tube it should not evolve an ammoniacal odour, nor should the vapour emitted possess an alkaline reaction towards moistened red Litmus paper. When the aqueous solution is acidified with Nitric Acid it should answer the test given under the heading of Silver Nitrate given below, and when the aqueous solution is saturated with Acetic Acid it should respond to the Barium Nitrate test described below, indicating the absence of Chlorides and Sulphates. The absence of Thiocyanates may be determined by the under-mentioned test with Ferric Chloride. The *B.P.* employs Mercuric Chloride T.S. as a means of distinguishing Sodium Carbonate from Sodium Bicarbonate. The test has been discarded by both the *U.S.P.* and the *P.G.* The *B.P.* requires that a solution of the salt in cold Water should give, with Mercuric Chloride T.S., a whitish precipitate, becoming brownish-red on standing; soluble Carbonates being stated in the Appendix to afford a brownish-red precipitate with Mercuric Chloride T.S. Howard has pointed out (*C.D.* '98, i. 675) that a pure sample will not pass the *B.P.* tests. Attfield (*Digest of Researches and Criticisms Report for* 1898) replies that the test is clearly not given as a 'pass' test of purity, but only as a 'distinction' test, and suggests that the critic missed an opportunity of recommending the addition of the following useful words to the official sentence: 'A solution of the salt in cold Water gives either no precipitate immediately or only a whitish precipitate, becoming reddish-brown on standing.' The *U.S.P.* and *P.G.* adopt practically the same method for determining the presence of the Normal Carbonate, which is described under the heading of Phenolphthalein in small type below. Traces of Sodium Carbonate, and also of Water, are probably present in all commercial Sodium Bicarbonates, but it may still pass the *B.P.* titration test, owing to the counter-balancing influence of the two impurities. The actual Carbonate may be estimated by adding an excess of Normal Volumetric Sodium Hydroxide Solution free from Carbonate, then an excess of Barium Chloride Solution, and titrating with Volumetric Sulphuric Acid Solution, using Phenolphthalein Solution as an indicator of neutrality. It has been recommended that the tests for Carbonate in the present official volume should be replaced by one on the lines of that in the *U.S.P.*, in the next revision. The *B.P.* includes, in addition to the above list of substances, Magnesium, Potassium, Sulphites and Thiosulphates as likely impurities, and requires that the salt should yield the customary no characteristic reaction with the tests for the three former and gives a test with Ferric Chloride Solution for the detection of the last named; no red coloration should be produced when the reagent is added to an aqueous solution acidified with Hydrochloric Acid.

Phenolphthalein.—A solution of 1 gramme of the salt in 20 c.c. of Water dissolved without agitation at a temperature not exceeding 15° C. (59° F.) should not be immediately coloured red by 3 drops of Phenolphthalein T.S., and any faint reddening produced should be discharged by 0·2 c.c. of Normal Volumetric Hydrochloric Acid Solution, *P.G.* The *U.S.P.* states that in such a solution a red tint should not be produced immediately on the addition of 0·2 c.c. of Normal Volumetric Hydrochloric Acid Solution and 2 drops of Phenolphthalein T.S.

Ferric Chloride.—5 c.c. of an aqueous solution (1 in 20) should not be coloured red by 1 drop of T.S. of Ferric Chloride, *U.S.P.*, also in *B.P.* and *P.G.*; the *B.P.* does not give quantities, and the *P.G.* uses a 1–50 solution acidulated with Nitric Acid.

Hydrogen Sulphide.—An aqueous solution of the salt (1–50) saturated with Acetic Acid should not be affected by T.S. of Hydrogen Sulphide, *P.G.* An aqueous solution (1–20) acidulated with Hydrochloric Acid should not respond to time-limit test for heavy metals, *U.S.P.*

Barium Nitrate.—An aqueous solution of the salt (1–50) saturated with Acetic Acid should be rendered not more than faintly opalescent by Barium Nitrate T.S. within 2 minutes, *P.G.*

Silver Nitrate.—An aqueous solution (1–50) acidulated with Nitric Acid should be clear and should not show more than a whitish opalescence within 10 minutes on the addition of T.S. of Silver Nitrate, *P.G.*

Volumetric Determination.—23·7 (23·74) c.c. of Normal Sulphuric Acid Volumetric Solution should be necessary to completely neutralise 2 grammes of the salt, Methyl Orange T.S. being used as indicator, *U.S.P.*

Preparations.

TROCHISCUS SODII BICARBONATIS.—Sodium Bicarbonate Lozenge.

Contain 3 grains in each, with Rose basis.

Dose.—1 to 6 lozenges.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Fr., Ital., Jap., Mex., Norw., Port., Russ., Span., Swiss and U.S.

SODII CITRO-TARTRAS EFFERVESCENS. Effervescent Sodium Citro-Tartrate.

Sodium Bicarbonate, 51; Tartaric Acid, 27; Citric Acid, 18; Refined Sugar, 15; all in powder; made into granules, the yield of which is about 100.

Dose.—60 to 120 grains = 4 to 8 grammes, as a mild, saline purgative.

Not Official.

SAL EMSANUM FACTICIUM.—Dried Sodium Sulphate, 7; Potassium Sulphate, 13; Sodium Chloride, 325; Sodium Bicarbonate, 655.—*Dutch.*

TROCHISCI BICARBONATIS NATRICI COMPOSITI.—Salis Emsani facticii, 25; Sugar, 75.—*Dutch.*

COLLUNARIUM ALKALINUM.—Sodium Bicarbonate and Borax, of each 3 grains; Phenol, 1 grain; White Sugar, 5 grains; Water, to 1 oz.—*Throat.*

COLLUNARIUM ALKALINUM CO.—Sodium Bicarbonate, Borax, Sodium Chloride, of each 2 grains; White Sugar, 5 grains; Water, to 1 oz.—*Throat.*

MISTURA SODÆ COMPOSITA. Gentian Root, 5 grains; Rhubarb Root, 2 grains; Ginger, 1 grain; Sodium Bicarbonate, 10 grains; Peppermint Water, to 1 fl oz. Macerate the Gentian, Rhubarb and Ginger sliced, with the Sodium Bicarbonate in the Peppermint Water for 24 hours, then press out the liquor, strain, and pour Peppermint Water over the strainer until the product measures 1 fl. oz. *St. Thomas's.*

This has been incorporated in the *B.P.C.* with the *syn.* Peacock's Stomachic Mixture.

NEBULA ALKALINA.—Sodium Bicarbonate, 15 grains; Borax, 15 grains; Carbolic Acid, 4 grains; Glycerin, 45 minims; Water, to 1 oz.—*Throat.*

Nebula Alkalina Composita.—Sodium Bicarbonate, 1·50; Borax, 1·50; Carbolic Acid, 0·75; Glycerin, 25; Distilled Water, *q.s.* to produce 100. *B.P.C.*

SODII BROMIDUM.

SODIUM BROMIDE.

NaBr, eq. 102·23.

FR., BROMURE DE SODIUM; GER., NATRIUMBROMID; ITAL., BROMURO DI SODIO; SPAN., BROMURO SODICO.

Minute white crystals, or a white crystalline powder, possessing a saline, slightly bitter taste. It may be prepared in a similar manner to Potassium Bromide, employing Sodium Hydroxide in place of Potassium Hydroxide.

As this salt is very deliquescent it should be kept in well-stoppered bottles. It may be prepared either anhydrous, or containing $2H_2O$.

Solubility.—5 in 6 of Water, and measures 7½; 1 in 16 of Alcohol (90 p.c.).

Medicinal Properties.—Similar to Potassium Bromide, but less depressant, and more easily tolerated by the stomach.

It has been recommended as a remedy for sea-sickness in 60-grain doses 3 times a day for at least 2 days before embarkation on a long voyage, the doses being reduced to half when on board. *B.M.J.* '81, ii. 730.

Deprivation of salt and substitution of Bromide, about ½ oz. per week being taken in epilepsy.—*B.M.J.* '03, i. 552.

A nightly draught containing from 20 to 30 grains, together with a cachet containing 10 grains of Chloralamide, and followed by a second cachet containing 10 grains of Chloralamide if sleeplessness persists; in the treatment of insomnia accompanying the rapid heart of influenza.—*L.* '99, ii. 1079.

In the treatment of acute mania, 2 drm. in a half tumbler of Water every 2 hours until 1 oz. is given the first day, a similar amount given on the second day, and this may suffice to effect the result desired, which is not at its height until the fourth or fifth day, ceasing the administration for 24 hours, when drowsiness is so profound that the patient cannot be roused, or if when roused talk is incoherent.—*B.M.J.* '00, i. 134.

Given in the treatment of the Morphine, Chloral and Cocaine habits: 30 grains twice daily increasing the dose to 40, 50, 60, and even 120 grains if required.—*T.G.* '90, 600; 30 to 60 grains every 3 or 4 hours for a day or two.—*B.M.J.* '97, ii. 77; 120 grains in solution every 2 hours for the first 2 days, and 60 grains during the third day.—*B.M.J.* '99, i. 898.

Dose.—5 to 30 grains = 0·32 to 2 grammes.

Prescribing Notes.—*Generally given in* **solution**; *it may be prescribed in* **powders** *if carefully wrapped in Tin foil. It is also given in* **Compressed Tablets** *and* **Effervescent Granules.**

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Norw., Russ., Span., Swed., Swiss and U.S.

Tests.—Sodium Bromide when heated melts, and when strongly heated volatilises slowly without decomposition. It answers the tests distinctive of Sodium given under that heading. It dissolves readily in Water, forming a clear solution which is neutral to Litmus, or only faintly alkaline in reaction towards red Litmus paper. The aqueous solution yields, on the addition of Silver Nitrate Solution, a yellowish curdy precipitate, practically insoluble in Ammonia Solution, insoluble in Nitric Acid, readily soluble in Potassium Cyanide Solution. With Chlorine Solution it affords a reddish coloration, which passes into chloroformic solution when shaken with that menstruum. A small portion of the salt, heated with Sulphuric Acid and a little Manganese Dioxide, evolves reddish vapours of Bromine, which impart an orange-yellow colour to Starch paper. It is officially required, when dry, to contain not less than 97·9 nor more than 99·98 p.c. of pure Sodium Bromide, as volumetrically determined by titration with Tenth-normal Volumetric Silver Nitrate Solution, as indicated below under the heading Volumetric Determination. The *U.S.P.* requires that it shall contain, when dried, not less than 97 p.c. of pure Sodium Bromide, as volumetrically determined by the method given in small type below. The *P.G.* requires that the salt dried at 100° C. (212° F.) shall contain not more than 100·6 p.c. of pure Sodium Bromide, as volumetrically determined by the process also given below.

The more generally occurring impurities are Arsenic, Lead, Copper, Iron and Zinc, Barium and Calcium, Ammonium, Carbonates, Cyanides, Bromates, Iodates, Chlorides, Iodides, Sulphates and Thiocyanates. Arsenic, Lead, Copper, Iron and Zinc may be detected by Hydrogen Sulphide, either in a solution rendered slightly acid or in a solution rendered faintly alkaline by Ammonia Solution. Barium may be detected by the test described below under the heading of Potassium Sulphate. The aqueous solution should afford no opalescence when tested with Ammonium Oxalate Solution, indicating the absence of Calcium. When boiled with Potassium Hydroxide Solution it should afford no ammoniacal odour, nor should the evolved vapours exhibit an alkaline reaction towards moistened red Litmus paper, indicating the absence of Ammonium salts. An aqueous solution of the salt should yield no effervescence on the addition of Diluted Hydrochloric Acid, indicating the absence of Carbonates, nor should an odour of Hydrocyanic Acid be noticeable when the acidified solution is gently warmed, indicating the absence of Cyanides. Bromates, if present, may be detected by the Sulphuric Acid test given in small type. The aqueous solution, when mixed with Potassium Iodide Solution and Tartaric Acid, should not yield a blue coloration on the addition of Starch Mucilage, indicating the absence of Iodate. If the aqueous solution be completely precipitated with Silver Nitrate Solution and the precipitate be treated with Ammonia Solution and filtered, the filtrate shall yield only a faint turbidity when acidified with Diluted Nitric Acid, indicating the absence of more than a trace of Chloride. Iodides, if present, may be detected by the test described under the heading of Chlorine Water and Chloroform given in small type. The aqueous solution should not afford a distinct turbidity on the addition of Barium Chloride Solution. The *P.G.* includes a separate test for Iron, which is described under the heading of Potassium Ferrocyanide in small type. The *B.P.* includes a test for Thiocyanates, requiring that Ferric Chloride T.S. should not cause a red coloration in an aqueous solution of the salt. It has been suggested (*P.J.* '01, i. 460) that the following modification of the Thiocyanate test should be made in the next revision of the *B.P.* A weighed quantity of a gramme of the salt dissolved in 10 c.c. of Water should give a yellow and not a red or reddish-brown coloration on the addition of 2 drops of Ferric Chloride T.S. (absence of more than 0·01 p.c. of Ammonium Thiocyanate). Neither the *U.S.P.* nor the *P.G.* includes a test for Thiocyanate.

Sulphuric Acid.—If diluted Sulphuric Acid be dropped upon some of the powdered salt no yellow colour should appear at once, *P.G.* and *U.S.P.*

Hydrogen Sulphide.—The aqueous solution of the salt (1–20) should not be affected by T.S. of Hydrogen Sulphide, *P.G.* The *U.S.P.* requires that such an aqueous solution slightly acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals.

Phenolphthalein.—A solution of 1 gramme of the salt in 10 c.c. of Water and 0·1 c.c. of Tenth-normal Sulphuric Acid Volumetric Solution added should not yield any colour with a drop of Phenolphthalein T.S., even after boiling, *U.S.P.*

Potassium Sulphate.—10 c.c. of an aqueous solution (1–20) acidulated with Hydrochloric Acid should not be rendered turbid by 1 c.c. of T.S. of Potassium Sulphate, *U.S.P.* The *P.G.* requires that an aqueous solution (1–20) should not be affected by diluted Sulphuric Acid.

Potassium Ferrocyanide.—20 c.c. of an aqueous solution (1–20) previously acidulated with a few drops of Hydrochloric Acid should not be rendered blue by 0·5 c.c. of T.S. of Potassium Ferrocyanide, *P.G.*

Chlorine Water and Chloroform.—If to 10 c.c. of an aqueous solution of the salt (1 in 20) 1 c.c. of Chloroform be added, and then Chlorine Water which has been diluted with an equal volume of Water be cautiously introduced, drop by drop, with constant agitation, the liberated Bromine will dissolve in the Chloroform, imparting to it a yellow to orange colour, free from any violet tint, *U.S.P.*

Volumetric Determination.—Not less than 95·8 and not more than 97·8 c.c. of Silver Nitrate Volumetric Solution should be necessary for the complete precipitation of 1 gramme of the dry salt dissolved in Water, *B.P.*; 10 c.c. of an aqueous solution (3 grammes in 100 c.c.) of the salt, which has been dried at 100° C. (212° F.), should after the addition of a few drops of Potassium Chromate T.S. require not more than 29·3 c.c. of Tenth-normal Silver Nitrate Volumetric Solution to produce a permanent red colour, *P.G.*; a solution of 0·3 gramme of dried salt in 50 c.c. of Water with 2 drops of Potassium Chromate T.S. added should require not less than 28·5 nor more than 30 c.c. of Tenth-normal Volumetric Silver Nitrate Solution to produce a permanent red colour, *U.S.P.*

Rubidium Bromide in doses of 5 to 30 grains = 0·32 to 2 grammes; and **Rubidium Ammonium Bromide**, in doses of 10 to 40 grains have been introduced as substitutes for the alkaline Bromides in epilepsy.

Not Official.

SODII CACODYLAS.

$NaAs(CH_3)_2O_2$, eq. 158·96.

White, odourless crystals, or as a white, amorphous, deliquescent powder.

It may be obtained by exactly neutralising Cacodylic Acid with the quantity of Sodium Hydroxide indicated by titration with Normal Volumetric Sodium Hydroxide Solution. It may be prepared anhydrous, but the anhydrous salt is very deliquescent; as it usually exists commercially it contains 2 to 3 molecules of Water of crystallisation.

It should be kept in well-stoppered glass bottles and exposed as little as possible to the air, as it is of a deliquescent nature and readily absorbs moisture.

Solubility.—2 in 1 of Water, 1 in 1 of Alcohol (90 p.c.).

It has been recommended on account of its lesser toxicity in all cases where Arsenic is usually employed, *e.g.*, in tuberculous disease, anæmia, psoriasis and skin affections. It has also been used in the treatment of certain affections of the eye. When administered by the mouth in the form of pill or in solution it frequently imparts a disagreeable alliaceous odour to the breath, but when administered by hypodermic injection this objectionable feature is absent.

Professor Fraser has shown that when a salt of Cacodylic Acid is administered, it is absorbed and is eliminated, but the Arsenic it contains is so firmly combined that it does not become dissociated, and is therefore incapable of forming any compound in the body which can produce the well-known pharmacological activities of the usual therapeutic compounds of Arsenic. It has been found by Crocker to be a failure in skin diseases.—*B.M.J.* '02, i. 712; '02, ii. 656; *L.* '02, i. 748; '03, i. 785.

General references.—*L.* '00, ii. 1446, 1923; '01, i. 1462; '02, i. 676; *B.M.J.* '00, ii. 1823; '01, i. 120; *B.M.J.E.* '01, ii. 32, 48, 83; *P.J.* '00, ii. 724; '02, ii. 336, 697; *C.D.* '02, i. 59, 291, 466; *T.G.* '01, 790. Efficacious in yaws, *L.* '07, ii. 1459.

Foreign Pharmacopœias.—Official in Fr.

Tests.—Sodium Cacodylate melts at a moderately low temperature. It dissolves readily and completely in Water, forming a clear solution possessing a faintly alkaline reaction towards red Litmus paper. It yields no precipitate with Hydrogen Sulphide. It may be quantitatively determined by titration with Tenth-normal Volumetric Hydrochloric Acid Solution, using Methyl Orange Solution as an indicator of neutrality. Cacodylic Acid is in itself neutral in reaction towards Methyl Orange Solution, whilst the Sodium Cacodylate is readily decomposed by the Volumetric Hydrochloric Acid Solution. 1 c.c. of Tenth-normal Volumetric Hydrochloric Acid Solution corresponds to 0·015896 gramme of anhydrous Sodium Cacodylate. Occasionally commercial samples are found which contain free Cacodylic Acid, although there is no reason why, if carefully prepared, the resulting Cacodylate should not be neutral. In these cases, the free Cacodylic Acid may be determined by titration with Tenth-normal Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. 1 c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution is equivalent to 0·013708 gramme of pure Cacodylic Acid. The titration may then be continued with Tenth-normal Volumetric Hydrochloric Acid Solution, using Methyl Orange Solution as an indicator of neutrality. The number of c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution required to neutralise the free Cacodylic Acid should be deducted from the number of c.c. of Tenth-normal Volumetric Hydrochloric Acid Solution required for the total titration with Methyl Orange Solution, the difference being calculated into anhydrous Sodium Cacodylate. 1 c.c. of Tenth-normal Volumetric Hydrochloric Acid Solution corresponds to 0·015896 gramme of anhydrous Sodium Cacodylate. An aqueous solution of the salt when acidified with Nitric Acid should yield little or no turbidity on the addition of Silver Nitrate or of Barium Chloride Solution, indicating the absence of more than traces of Chlorides or Sulphates. It should not yield a precipitate on being rendered faintly alkaline with Lime Water, indicating the absence of Arsenic or Arsenious Acids and Oxalates. Cacodylates may be distinguished from Methylarsenates and the presence of traces of the former in the latter detected by the reaction with an acid solution of Hypophosphorous Acid, prepared by dissolving 20 grammes of Sodium Hypophosphite in 20 c.c. of Water and adding 200 c.c. of pure Hydrochloric Acid, a little Sodium Chloride crystallises out and may be separated by straining through absorbent Cotton-Wool. In applying the test 1 c.c. of a solution containing a trace of Cacodylate is added to 10 c.c. of the Acid Hypophosphite reagent, and the tube corked and allowed to remain at rest, an odour of Cacodyl will be developed after a time, even ½ mg. of Sodium Cacodylate giving a perfectly distinct odour in 12 hours, but no precipitate of Arsenic. In solutions containing larger quantities of Cacodylate a deposit of Arsenic is slowly formed on the sides of the tube. In the case of Methylarsenates no odour is evolved, the whole of the Arsenic in combination is precipitated at once.

INJECTIO SODII CACODYLATIS.—A sterilised solution, containing ¾ grain of pure Sodium Cacodylate in 17 minims. Also put up in glass capsules, each containing 1 c.c.

Elixir Sodii Cacodylatis.—An elixir, each fl. oz. of which contains ¾ grain pure Sodium Cacodylate.

Globules Sodii Cacodylatis.—Globules containing ¼ grain pure Sodium Cacodylate; also globules containing ⅛ grain.

ACIDUM CACODYLICUM. Cacodylic Acid. $HAs(CH_3)_2O_2$, eq. 137·08.

Tests.—Cacodylic Acid or Di-methyl Arsenic Acid melts at about 200° C. (392° F.). It dissolves readily and completely in Water, forming a clear solution which possesses an acid reaction towards Litmus paper and towards Phenolphthalein Solution. The acid is reduced to Cacodyl Oxide by Phosphorous Acid, and is converted into Cacodyl Sulphide by Hydrogen Sulphide in the presence of Water, but by dry Hydrogen Sulphide it is converted into Thio-cacodylic Acid. The alcoholic solution gives a precipitate with Alcoholic Mercuric Chloride Solution. It may be determined quantitatively by titration with Normal Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. 1 c.c. of Normal Volumetric Sodium Hydroxide Solution is equivalent to 0·13708 gramme of pure Cacodylic Acid. The aqueous solution when acidified with Nitric Acid should yield at the most but a faint turbidity with Silver Nitrate Solution, or with Barium Chloride Solution, indicating the absence of more than traces of Chlorides or Sulphates. When rendered faintly alkaline with Lime Water it should yield no decided turbidity or precipitate, indicating the absence of Arsenious or Arsenic Acids and Oxalates. When ignited with free access of air it should burn leaving no weighable residue.

FERRI CACODYLAS (Iron Cacodylate).—A yellow, or reddish-yellow, amorphous powder, soluble 1 in 15 of Water, insoluble in Alcohol (90 p.c.). Successful in anæmia.—*B.M.J.* '02, i. 713; *B.M.J.E.* '00, ii. 58; '02, ii. 87; *P.J.* '00, ii. 724; '03, i. 197.

Dose.—¾ to 5 grains by the mouth. 17 minims = 1 c.c. of the undermentioned solution hypodermically.

Tests.—Iron Cacodylate dissolves in Water, forming a clear solution which possesses an acid reaction towards blue Litmus paper. When ignited it leaves a residue consisting of Ferric Oxide which, when dissolved in Hydrochloric Acid containing a trace of Nitric Acid, yields the tests distinctive of Ferric salts given under Ferrum, p. 504. Commercial samples yield about 28·9 p.c. of Ferric Oxide on ignition. An alcoholic solution of Mercuric Chloride yields a yellow precipitate. The Iron Oxide should be also free from the impurities mentioned under Liquor Ferri Perchloridi Fortis, with the exception of Arsenic.

Injectio Ferri Cacodylatis.—A sterilised solution containing ¾ grain of Iron Cacodylate in 17 minims of solution. Also a double strength solution containing 1½ grains in 17 minims. Used with success in anæmia.

MAGNESII CACODYLAS (Magnesium Cacodylate).—A white, amorphous powder, readily soluble in Water. Employed for the same purpose as the Sodium compound.—*P.J.* '02, i. 123.

DI-SODII METHYLARSENAS. Di-sodium Methylarsenate. $Na_2CH_3AsO_3$, $6H_2O$, eq. 290·09.—Colourless translucent crystals, or masses of crystals, or as a white granular powder. Soluble 1 in 1½ of Water, insoluble in Alcohol (90 p.c.). Introduced as a comparatively non-toxic preparation of Arsenic, and employed in phthisis, in anæmias, and in malarial cachexia.—*L.* '02, i. 623; *B.M.J.* '02, i. 801; *B.M.J.E.* '02, i. 68; *P.J.* '02, i. 253, 256, 282.

Dose.—½ to 1 grain = 0·03 to 0·06 gramme in solution, hypodermically, or in pill form.

Though containing much Arsenic, practically an inert substance, and even in enormous quantities it was incapable of producing the well-defined pharmacological action, and the well-recognised toxic effects of the Arsenic ion, and also incapable of exerting the remedial or therapeutic influences which were those of the older and commonly used compounds of Arsenic.—*B.M.J.* '03, i. 428; *L.* '03, i. 304.

Non-toxic effect of organic Arsenic compounds demonstrated by Bunsen sixty years ago.—*L.* '03, i. 474.

Tests.—Di-sodium Methylarsenate dissolves readily in Water, forming a clear solution possessing a strongly alkaline reaction towards red Litmus paper. It may be determined quantitatively by titration with Tenth-normal Volumetric Sulphuric Acid, using Rosolic Acid Solution as an indicator of neutrality; in the event of free Methylarsenic Acid being present, it may be determined by first titrating with Tenth-normal Volumetric Sodium Hydroxide Solution, using a similar solution as an indicator. 1 c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution represents 0·013905 gramme of Methylarsenic Acid, the titration may then be continued with Tenth-normal Volumetric Acid Solution as above, deducting the number of c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution with Rosolic Acid Solution, the difference is calculated into terms of Di-sodium Methylarsenate. 1 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution represents 0·029009 gramme of Di-sodium Methylarsenate. It may also be determined by the much more intricate method of indirect Silver titration according to the method of Volhard. Di-sodium Methylarsenate may be distinguished from Sodium Cacodylate and the presence of a trace of the latter in an excess of the former by the Acid Hypophosphite reagent mentioned under Sodium Cacodylate. In performing the test it is only necessary to dissolve 0·2 of a gramme of the salt in 10 c.c. of the reagent, cork the tube and allow the mixture to stand for 12 hours, in the presence of even ½ mg. of Sodium Cacodylate a marked odour of Cacodyl will be evident.

The salt is also known under the commercial names of **Arrhenal** and **Arsinyl.**

Injectio Arsinyl.—A sterilised solution containing ½ grain of the pure salt in 17 minims.

Elixir Arsinyl.—An elixir containing ½ grain of the pure salt in 1 fl. drm.

ATOXYL is a white, odourless, crystalline powder, soluble 1 in 5 of Water, insoluble in Alcohol (90 p.c.). When originally introduced, the composition of Atoxyl was stated to be Met-arsenic Acid Anilide, but on account of the indifferent solubility of the salt, the Sodium salt of Met-arsenic Acid Anilide was introduced. It is not now believed to be an Aniline compound at all, but the Sodium salt of Para-aminophenylarsonic Acid. The *B.P.C.* mentions that Sodium Anilarsenate (*B.P.C.*) is also known under the trade name Atoxyl, but this statement is incorrect.

Dose.—¾ to 3 grains = 0·05 to 0·2 gramme. **Globules** = ½ grain (0·032 gramme) in each; **Elixir** = ½ grain (0·032 gramme) in each fl. drm. (3·6 c.c.); **Injection** = ½ grain (0·032 gramme) in 17 minims (1·0 c.c.).

A reference to this interesting compound, and the results of its action on trypanosomes, is recorded.—*B.M.J.* '05, i. 1142. The general conclusion formulated is that treatment with this compound is in many ways superior to the ordinary arsenical treatment, on account of the quicker but prolonged action of the drug on the parasite, the large doses which can be given without toxic symptoms, and the entire absence of any tendency to sloughing.

It is best administered intravenously in high doses and for a long period, pushing it to the maximal amount that the patient can stand without headache and nausea, at the same time building up the patient in every way possible that will conduce to a lessening of the anæmia.

A further reference to its use in trypanosomiasis.—*B.M.J.* '06, i. 1057. Inject subcutaneously in the form of a 20 p.c. solution in normal saline, in doses of 0·6 c.c. for 4 to 6 days, then increase the dose to 0·8 c.c. for 4 to 6 days, then to 1 c.c. per diem, continuing this dose until signs of intoxication begin to appear.

In trypanosomiasis, should be given as soon after infection as possible, and fresh solutions only must be used.—*L.* '08, i. 113.

Used with benefit in yaws (framboesia) both as a curative and preventive.—*L.* '07, ii. 1459.

Complete recovery from malaria after 2 injections of 1·2 c.c. of 10 p.c. solution.—*B.M.J.E.* '07, ii. 52.

Leading article on its value in trypanosomiasis.—*B.M.J.* '07, ii. 1733.

In syphilis.—*B.M.J.* '07, i. 1458; but with caution.—*B.M.J.* '07, ii. 294.

A specific in psoriasis.—*L.* '07, i. 1151.

Results in trypanosomiasis by the Atoxyl and Mercury method distinctly encouraging.—*B.M.J.* '07, ii. 624, 685.

It is stated to be at least 20 times less toxic than Arsenic, at any rate when given hypodermically. The solution of Atoxyl is readily decomposed by acids, alkalis, and light. It should therefore be made up fresh every few days. The solution turns yellow or brownish, and whereas a fresh solution when injected causes no irritation, the solution used after it has been kept some days causes inconvenience and irritation, the syringe used should be sterilised by boiling and not be placed in any antiseptic. The practice in London is to commence with 1 grain, repeating the injections every second day, adding ½ grain more each time until a dose of 3 grains is reached, this being then continued. A few cases have had as much as 8 grains twice in a week. In Brussels the custom is to inject that quantity of fluid which contains 3 grains of Atoxyl on the first day, to repeat the injection on the fourth or fifth day, increasing the amount to 3¾ grains, and continuing the injection every third, fourth or fifth day, increasing each dose by ¾ grain until as much as 12 grains at a single dose is reached. Treatment of trypanosomiasis is continued for 2 or 3 months, after which an interval of 2 months is given, the series being then repeated. Atoxyl used in small doses, such as a grain twice a week to begin with and gradually increasing it, has been suggested in the treatment of leuchæmia, pernicious anæmia, Hodgkin's disease.—*The Hospital*, Sept. 21 '07, p. 657.

It has also been recommended (*B.M.J.* '07, ii. 685, 708) combined with Mercuric Chloride and Methylene Blue as a remedy for trypanosomiasis in veterinary work. A 1 p.c. aqueous solution of Methylene Blue prepared from a saturated Alcoholic solution is mixed with an equal quantity of a 1 in 500 aqueous solution of Mercuric Chloride. A dose of 10 c.c. is intravenously injected, and these intravenous injections have been repeated daily for 10 days.

Tests.—Atoxyl dissolves readily in Water, forming a clear solution which possesses a neutral reaction towards Litmus paper, its aqueous solution reduces Potassium Permanganate Solution and Gold Chloride Solution. It yields with Ferrous Sulphate Solution a green precipitate, with Bromine Water a white precipitate, and with Sodium Hypobromite Solution a blackish-red coloration.

SOAMIN. Sodium Para-aminophenylarsonate. $NaNH_2C_6H_5AsO_3$ $5H_2O$, eq. 326·82. Is an organic combination of Arsenic, of which it contains 22·8 p.c. It has been introduced for the treatment of syphilis and has been recently used with favourable results. It may be given by hypodermic injection, beginning with doses of 3 grains every third day and gradually raised to 10 grains every other day until a total of 100 grains has been given. As all the necessary physiological effects may be obtained with this dose it is not considered wise or necessary to push it any higher; the preparation should not be given by the mouth.—*B.M.J.* '08, ii. 393.

SODII CARBONAS.

SODIUM CARBONATE.

Na_2CO_3, $10H_2O$, eq. 284·11.

FR., CARBONATE NEUTRE DE SODIUM CRISTALLISÉ OFFICINAL; GER., NATRIUMCARBONAT; ITAL., CARBONATO DI SODIO; SPAN., CARBONATO SODICO CRISTALIZADO.

Colourless, translucent, efflorescent, monoclinic crystals, possessing a somewhat caustic taste and an alkaline reaction. Sodium Carbonate (*B.P.*) contains 10 molecules of Water of crystallisation. The Sodium Carbonate official in the *U.S.P.* is mono-hydrated Sodium Carbonate containing 1 molecule of Water of crystallisation. The Sodium Carbonate (*P.G.*) is similar to the British and contains 10 molecules of Water of crystallisation.

It should be kept in well-closed vessels, as it has a tendency to effloresce on exposure to dry air.

Solubility.—5 in 8 of Water at 60° F., and measures 11; 12 in 1 of Water at 100° F.; almost insoluble in Alcohol (90 p.c.).

Medicinal Properties.—Antacid; but it is so apt to irritate that the Bicarbonate is almost invariably preferred. Externally, as a lotion (30 grains to a pint) in eczema.

Dose.—5 to 30 grains = 0·32 to 2 grammes.

Prescribing Notes.—*The* **Exsiccated salt** *may be given in the form of* **pills** *massed with 'Diluted Glucose.'*

143 *grains of the crystallised salt are equal to nearly* 53 *grains of the* **Exsiccated** *salt.*

20 *of Sodium Carbonate are neutralised by* 9·8 *of Citric Acid, and by* 10·5 *of Tartaric Acid.*

Official Preparation.—Sodii Carbonas Exsiccatus used in the preparation of Extractum Ergotæ and many Sodium salts; also Liquor Magnesii Carbonatis and various Carbonates, etc. The **Exsiccated Carbonate** is used in the preparation of Pilula Ferri.

Not Official.—Balneum Alkalinum, Bain Alcalin.

Foreign Pharmacopœias.—Official in all.

U.S. has only Sodii Carbonas Monohydratus.

Tests.—Sodium Carbonate when heated liquefies, loses its Water of crystallisation amounting to 62·93 p.c. and leaves a white anhydrous salt. The *U.S.P.* salt when heated to 100° C. (212° F.) loses its Water of crystallisation, equivalent to 14·52 p.c. The *P.G.* states that 100 parts of the salt contain 37 p.c. of anhydrous Sodium Carbonate. On the addition of diluted Hydrochloric Acid it effervesces, giving off a colourless gas, which when passed into Lime Water yields a white precipitate soluble in a sufficient excess of the gas, and also soluble in a diluted mineral acid with effervescence. The resulting solution answers the tests distinctive of Sodium given under that heading. The *B.P.* requires that, with the exception of the Mercuric Chloride Solution test, it should answer the qualitative tests given under Sodii Bicarbonas. An aqueous solution is required to immediately yield a brownish-red precipitate on the addition of

Mercuric Chloride Solution. It is presumably intended that the Magnesium Sulphate Solution test should also be excluded, for it may safely be taken that the words 'it should afford the reactions characteristic of Sodium and of Bicarbonates' apply to the qualitative tests for the latter. Sodium Carbonate dissolves readily in Water, yielding a clear solution which possesses a strongly alkaline reaction towards red Litmus paper. It is officially required to yield at least 98·01 p.c. of pure crystallised Sodium Carbonate, equivalent to 43·23 p.c. of pure anhydrous Sodium Carbonate as determined by titration with Volumetric Sulphuric Acid Solution. The mono-hydrated Sodium Carbonate of the *U.S.P.* is required to contain not less than 85 p.c. of pure anhydrous Sodium Carbonate, corresponding to not less than 99·5 p.c. of the crystallised mono-hydrated salt. The *P.G.* requires that it shall contain not less than 100·2 p.c. of pure crystallised Sodium Carbonate. The *B.P.* and *P.G.* methods of determination will be found in the small type below under the heading of Volumetric Determination. It will be observed that neither the *B.P.* nor the *P.G.* mentions a suitable indicator of neutrality. The *U.S.P.* requires that Methyl Orange Solution shall be used.

The more generally occurring impurities are such as are also found in the Bicarbonate, it may also contain Arsenic as an impurity. The tests given for the detection of the impurities under Sodii Bicarbonate may also be employed here; the modified Gutzeit's test may also be used for the detection of Arsenic. Standards have been suggested (*C.D.* '08, i. 796) of 10 parts per million for Lead and 2 parts per million for Arsenic. A standard suggested for Chloride is 0·1 p.c., calculated as Sodium Chloride.

Hydrogen Sulphide.—An aqueous solution (1–20) should not be affected by Hydrogen Sulphide T.S. either before or after acidulation with Acetic Acid, *P.G.*

Barium Nitrate. An aqueous solution (1–20) acidulated with Acetic Acid should not be affected by T.S. of Barium Nitrate, *P.G.*

Silver Nitrate.—An aqueous solution (1–20) with excess of Nitric Acid should not give more than a whitish opalescence within 10 minutes with T.S. of Silver Nitrate, *P.G.*

Sodium Hydroxide.—Warmed with Sodium Hydroxide T.S. the salt should not evolve Ammonia, *P.G.*

Volumetric Determination.—6·9 c.c. of Sulphuric Acid Volumetric Solution should be necessary to neutralise 1 gramme of the salt, *B.P.* Not less than 7 c.c. of Normal Volumetric Solution of Hydrochloric Acid, *P.G.*

Preparation.

SODII CARBONAS EXSICCATUS. Na_2CO_3, eq. 105·31. EXSICCATED SODIUM CARBONATE. DRIED CARBONATE OF SODIUM.—*B.P.* '85.

A white, amorphous, odourless powder, obtained by heating crystallised Sodium Carbonate until it loses 63 p.c. of its weight.

Dried Sodium Carbonate is not official in the *U.S.P.* The mono-hydrated salt being the only one adopted. The dried salt is official in the *P.G.*, but it does not correspond to the completely dehydrated salt of the *B.P.*, as it is prepared by drying coarsely-powdered Sodium Carbonate at a temperature not exceeding 25° C. (77° F.) until completely effloresced, protecting it from the dust, then at a temperature from 40° to 50° C. (104° to 122° F.) until it has lost half of its original weight. The official salt is obtained by heating Sodium Carbonate (temperature not stated) until it loses nearly 63 p.c. of its original weight, as stated above.

53 grains are equal to nearly 143 grains of crystallised salt.

Dose.—3 to 10 grains = 0·2 to 0·65 gramme.

Foreign Pharmacopœias.—Official in Austr., Dan., Fr., Ger., Hung., Jap., Russ., Span., Swed. and Swiss.

Tests.—Dried Sodium Carbonate answers the tests distinctive of Sodium and of Carbonates given under the heading of Sodii Carbonas. Beyond the facts that it is required by the *B.P.* to yield not more than traces of Water when strongly heated, and that it is directed to be prepared as above, no indication is given of the requisite quantity of anhydrous Sodium Carbonate which it should contain. No method of determination is given in the *B.P.* The *P.G.* requires that on the titration of a weighed quantity of 1 gramme of the dried Sodium Carbonate with Normal Volumetric Hydrochloric Acid, not less than 14 c.c. should be required for neutralisation. It should be free from the impurities mentioned under Sodium Bicarbonate, and also under Sodium Carbonate. It has been recommended that a limit of Water should be allowed and definitely stated.

Not Official.

BALNEUM ALKALINUM.—Crystals of Sodium Carbonate, 8 or 10 oz. to 60 gallons of Water.

Used in scaly skin diseases.

BAIN ALCALIN.—Crystallised Sodium Carbonate of commerce, 250 grammes dissolved in 1000 c.c. of Water and added to a bath.—*Fr.*

SODII CHLORIDUM.

SODIUM CHLORIDE.

NaCl, eq. 58·07.

FR., CHLORURE DE SODIUM OFFICINAL; GER., NATRIUMCHLORID; ITAL., CLORURO DI SODIO; SPAN., CLORURO SODICO.

White, cubical crystals, or a white, crystalline powder, possessing a strong, saline taste, and neutral reaction. It is prepared by purifying common salt.

Solubility.—1 in $2\frac{3}{4}$ of Water; 1 in $2\frac{3}{4}$ of boiling Water; 1 in 200 of Alcohol (90 p.c.).

Medicinal Properties.—In small doses, stimulant and tonic; in larger doses, purgative and emetic; in the form of enema, anthelmintic. It is an important article of diet. A pint or more of **Normal Saline Solution** is injected intravenously, subcutaneously, or into the rectum, according to urgency, in shock or collapse due to hæmorrhage, and in uræmia, eclampsia and cholera. Locally, as a fomentation to sprains and bruises. Salt water baths (1 lb. to 4 gallons) are tonic and stimulant, especially in children, and are useful in chronic rheumatism and gout. Nasal injection of a saturated solution is useful in ozœna. A recent cold is greatly relieved by douching the nostrils and gargling the throat with a weak solution of Salt; gargling is also serviceable in tonsillitis and chronic throat catarrh. In case of a leech being swallowed a strong solution of Salt should be drunk; it is also a valuable antidote in poisoning by Silver Nitrate.

Its value as an article of diet is well known. Soldiers are supplied with it: our army, 0·5 oz. daily; the French, 0·5; Prussian, 0·87; Russian, 1·86; for a long time the Russian soldiers had salt-money given, and it was only when scurvy attacked them that the money was stopped and the salt given instead.

Irrigation of the urethra with hot saline solution in treatment of gonorrhœa. —*B.M.J.E.* '01, ii. 60.

Saline transfusion for prevention of shock during prolonged operations.—*B.M.J.* '01, ii. 1139.

Intravenous injection of normal saline solution in a severe case of hæmatemesis; recovery.—*B.M.J.* '02, i. 770.

Since it is shown conclusively that a liberal allowance of salt may intensify the ascites, a diet relatively poor in Chlorides must be considered a useful therapautic measure in such cases. Good effects have been witnessed (*Pr.* lxxxiii. 699) from a cure by dechlorination in cases of ascites due to tubercular peritonitis, in pleurisy with effusion, and phlegmasia alba dolens.

In desperate cases of hæmorrhage the subcutaneous transfusion of saline fluid should be practised, as it can be done without disturbing the patient.—*B.M.J.* '05, i. 68.

Many of the symptoms, such as rigors and sweating, which are occasionally seen after intravenous transfusion of a solution of Sodium Chloride, are due to the chemical composition of the fluid being incorrect.—*L.* '05, i. 847.

Bearing on this statement, it appears (*B.M.J.* '04, ii. 1198) that the proper strength for normal saline solution is 0·9 p.c.

In collapse following severe hæmorrhage, intravenous transfusions with physiological salt solution should be performed as soon as possible.—*L.* '05, i. 854. 1 to 10 oz. of normal saline injected at one spot, the fluid being allowed to enter slowly, in the treatment of collapse following the great loss of fluid caused by diarrhœa of infants.—*Pr.* lxxiv. 508. A case of fatal poisoning caused by injecting 500 c.c. of an almost saturated solution from a stock bottle instead of the usual 0·9 p.c. solution.—*L.* '05, ii. 176. Subcutaneous injection of 100 to 300 c.c. of Atlantic sea water, reduced by dilution to isotonism with the blood, every 3 or 4 days in tuberculosis.—*M.P.* '05, ii. 383. Half a pint of normal saline solution injected twice daily in the treatment of congenital hypertrophic stenosis of the pylorus.—*L.* '05, ii. 503.

The injection of saline fluids may afford much assistance in surgical shock, but this fluid is expelled into the tissues more quickly the more profound the degree of shock, and the effect is therefore temporary and of no use whatever except to gain time, which may allow the superficial vessels to be made to relax or to relax spontaneously. In this way saline injections may make all the difference between losing and saving a patient's life.—*L.* '05, ii. 578.

Injection of normal saline is stated (*B.M.J.E.* '05, ii. 20) to show a superiority over other plans of treatment in delirium tremens.

In the treatment of puerperal eclampsia as an intercellular transfusion, the solution used contains 1 drm. each of Sodium Chloride and Sodium Acetate to a pint of Water. The solution is sterilised, and at 100° F. (37·7° C.) is run into the areolar tissue beneath the breast or after delivery into the lax abdominal wall.—*B.M.J.* '05, ii. 1635; *L.* '01, i. 1682; *B.M.J.* '01, i. 510, 958, 1144; '03, . 1023; '03, ii. 1332, 1378, 1408; *T.G.* '01, 616, 623.

General formulas for saline solutions.—*Pr.* lxvii. 486; *P.J.* '99, ii. 141.

In pneumonia.—*B.M.J.* '00, ii. 900.

In diabetic coma.—*B.M.J.* '03, i. 544.

Dose.—10 to 60 grains = 0·65 to 4 grammes, as a tonic; as an emetic, ½ to 1 oz. = 14·2 to 28·4 grammes.

Official Preparation.—Used in the preparation of Acidum Hydrochloricum, Hydrargyri Perchloridum, Hydrargyri Subchloridum, Sodii Bicarbonas and Sodii Sulphas.

Not Official.—Normal Saline Solution, Pulvis Salinus Anticholeraicus and Nebula Sodii Chloridi Composita.

Foreign Pharmacopœias.—Official in Austr. Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Mex., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—Sodium Chloride when heated decrepitates and at a red heat fuses. It dissolves readily in Water, forming a clear solution which is neutral in reaction towards Litmus paper and which yields the tests distinctive of Sodium given under that heading. It also yields on the addition of Silver Nitrate Solution a white curdy precipitate insoluble in Nitric Acid, readily soluble in Ammonia Solution and reprecipitated on acidification with Nitric Acid. When mixed with Sulphuric Acid it evolves Hydrochloric Acid gas, which immediately reddens a piece of moistened blue Litmus paper. When heated with Manganese Dioxide and Sulphuric Acid it evolves a yellowish gas, which first reddens and then bleaches a piece of moistened blue Litmus paper, and which instantly liberates Iodine from Potassium Iodide Solution, recognisable by the blue colour which it produces with Mucilage of Starch. Neither the *B.P.* nor the *P.G.* includes a requisite percentage of pure Sodium Chloride nor a method for its quantitative determination. The *U.S.P.* requires that the salt when dried should contain not less than 99 p.c. of pure Sodium Chloride as volumetrically determined by the method given in small type below under the heading of Volumetric Determination.

The more generally occurring impurities are Calcium and Magnesium, Bromides, Iodides and Sulphates. The *B.P.* includes also Potassium as a likely impurity. Calcium and Magnesium, if present, may be detected by the test with Ammonium Oxalate and Sodium Phosphate. Bromides or Iodides, if present, may be detected by the test with Chlorine Water given below under that heading. Sulphates by the test with Barium Nitrate Solution given under the heading of Barium Nitrate. The *P.G.* includes a separate test for Iron with Potassium Ferrocyanide Solution; the *U.S.P.* tests for Arsenic, Copper, Lead, Iron and Zinc by means of the time-limit test with Hydrogen Sulphide. Each of these tests is described below under the headings Potassium Ferrocyanide and Hydrogen Sulphide. Standards have been suggested (*C.D.* '08, i. 796) of 10 parts per million for Lead, and 1 part per million for Arsenic.

Hydrogen Sulphide.—An aqueous solution (1–20) of the salt should not be affected by T.S. of Hydrogen Sulphide, *P.G.*; slightly acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Barium Nitrate.—An aqueous solution (1–20) of the salt should not be affected by T.S. of Barium Nitrate, *P.G.*

Sulphuric Acid.—An aqueous solution (1–20) of the salt should not be affected by diluted Sulphuric Acid, *P.G.*

Ammonium Oxalate.—An aqueous solution (1–20) after the addition of Ammonia T.S. should not be affected by T.S. of Ammonium Oxalate, *P.G.*

Sodium Phosphate.—An aqueous solution (1–20) after the addition of Ammonia T.S. should not be affected by T.S. of Sodium Phosphate, *P.G.*

Potassium Ferrocyanide.—20 c.c. of an aqueous solution (1–20) should not be rendered blue by 0·5 c.c. of T.S. of Potassium Ferrocyanide, *P.G.*

Chlorine Water.—If 2 grammes of the finely powdered salt be digested for some hours with 25 c.c. of warm Alcohol and, after cooling, the undissolved salt be removed by filtration, the filtrate evaporated to dryness, and the residue dissolved in 5 c.c. of Water, and if 1 c.c. of Chloroform be added, and Chlorine Water which has been diluted with twice its volume of Water, cautiously introduced, drop by drop, with constant agitation, the Chloroform should not acquire a violet, yellow, or orange colour, *U.S.P.*

Volumetric Determination.—If 1 gramme of well dried Sodium Chloride be dissolved in sufficient Distilled Water to measure 100 c.c., and 10 c.c. of the solution be mixed with a few drops of Potassium Chromate T.S., it should require not less than 17 (17·05) c.c. of Tenth-normal Volumetric Silver Nitrate Solution to produce a permanent red colour, *U.S.P.*

Not Official.

NORMAL SALINE SOLUTION (also called Physiological Salt Solution).—Sodium Chloride, 78·75 grains; boiled and cooled Water, to 20 fl. oz. (or in any case, sterilised).

On the authority of Professor Stirling, of Manchester, the percentage of Sodium Chloride in human blood is taken to be 0·9 p.c. The usual figure 0·6 p.c. is for cold-blooded animals, and was calculated on the blood of a frog.

Solutions the osmotic pressure of which is the same as that of blood plasma, are said to be isotonic with the blood. If a solution the osmotic pressure of which is markedly less than that of blood plasma be used, many of the red corpuscles may be destroyed. The salt in greatest amount in the plasma is Sodium Chloride, and therefore in making isotonic solutions this salt is generally used. A solution containing 0·9 p.c. Sodium Chloride gives the same osmotic pressure as plasma, and is therefore isotonic with the blood.

PULVIS SALINUS ANTICHOLERAICUS (*Stevens*). Sodium Bicarbonate, 30 grains; Sodium Chloride, 20 grains; Potassium Chlorate, 7 grains; for 1 dose.

Given frequently in a small tumbler of Water in diarrhœa and cholera.

NEBULA SODII CHLORIDI COMPOSITA.—Sodium Chloride, 1; Sodium Bicarbonate, 1; Borax, 1.

1 teaspoonful to be dissolved in a pint of warm Water, and used as a spraying solution.—*University.*

Sodium Bicarbonate, 1·50; Sodium Chloride, 0·75; Borax, 1·50; Distilled Water, warm, *q.s.* to produce 100.—*B.P.C.*

Not Official.

SODII CINNAMAS.

SODIUM CINNAMATE.

Na $C_9H_7O_2$, eq. 168·83.

A white, granular, amorphous powder, having a faint cinnamon-like odour, and a faintly alkaline reaction. Soluble 1 in 11 of Water, 1 in 160 of Alcohol (90 p.c.). It has been used in phthisis and in cancer, as an intramuscular or intravenous injection (15 to 30 minims of a 10 or 20 p.c. aqueous or Glycerin solution). In ophthalmic surgery it has been employed in the form of a 1 p.c. (7 to 8 minims) aqueous solution by subconjunctival injection.—*L.* '02, ii. 66, 67, 1755; *B.M.J.E.* '01, i. 67; '02, i. 28; *P.J.* '02, i. 550; *C.D.* '02, ii. 155.

In tuberculosis, commencing with doses of 1 mg. = $\frac{1}{10}$ c.c. of a 1 p.c. solution, increasing the dose by ½ to 1 mg. until 10, 15, or even 20 mg. are reached; the injections being given 3 times a week.—*B.M.J.E.* '04, i. 71.

Though not a specific, it is a useful adjunct to treatment of tuberculosis. Dose, 20 to 50 mg. (maximum). Leucocytosis produced by about 20 mg.—*L.* '04, ii. 1136; *B.M.J.E.* '05, i. 24.

In the treatment of cancer it is administered once or twice a week in the form of a 10 p.c. Glycerin solution in doses of 30 minims (1·8 c.c.) hypodermically. The hypodermic use of a 22 p.c. aqueous solution of Sodium Orthocoumarate in doses of 25 minims (1·5 c.c.), administered at the same interval, is also referred to.—*B.M.J.* '05, i. 927.

In a plea for more extended use of treatment by hypodermic injection a reference is made (*L.* '05, i. 1340) to the successful employment of this salt by Landerer in 1893 in the treatment of pulmonary tuberculosis.

A further reference to the use of these salts in cancer, and to a serum prepared from tuberculous horses after repeated injections with Sodium Cinnamate, is in *L.* '05, ii. 393.

An interesting point concerning the solubility of this salt and the preparation of the solution is dealt with in a paper on Solubility appearing in the *P.J.* [4], 20, 786; *C.D.* '05, ii. 783.

The most active chemical substance examined was Cinnamic Aldehyde; its administration is, however, exceedingly painful, and had to be temporarily abandoned.

Although the correct figure for the solubility of this salt is 1 in 11, a clear solution may be prepared by the aid of heat of a strength of 1 in 10, but it requires very careful handling, and the friction of the stopper of the bottle is very often sufficient to cause the salt to crystallise out. For hypodermic use the solution should be a little weaker than 10 p.c. Some authorities have claimed that a clear permanent 10 p.c. solution may be prepared in absolute Glycerin, but this is contrary to our experience. The solution, though clear when first prepared, develops crystals in the course of a few days, and the specimens before us now are practically a solid mass of crystals. The salt has assumed importance owing to its hypodermic employment in pulmonary tuberculosis and cancer. Having had a large number of these solutions to prepare, this experience of the behaviour of the salt may prove useful to others.

Dose.—2 to 5 grains = 0·13 to 0·32 gramme.

It was introduced commercially as **Hetol.**

Tests.—Sodium Cinnamate when heated yields an aromatic odour somewhat resembling Bitter Almonds, and when ignited with free access of air leaves a more or less blackish residue which when dissolved in Water possesses a strong alkaline reaction towards red Litmus paper, and which effervesces on the addition of a diluted mineral acid.

The salt dissolves in Water, yielding a clear solution which is neutral in reaction towards Litmus paper. An aqueous solution yields with Ferric Chloride T.S. a yellow precipitate, and a white precipitate with Manganese Chloride Solution, which soon becomes crystalline. If the aqueous solution be sufficiently concentrated it yields on acidification with Diluted Sulphuric Acid a white crystalline precipitate soluble in Ether. If the ethereal solution be separated, washed till free from mineral acid and evaporated spontaneously, it yields a crystalline residue which should possess a m.p. of about 132° C. (269·6° F.), the aqueous portion remaining after the removal of the precipitated acid will answer the tests distinctive of Sodium given under that heading. When oxidised with Potassium Permanganate it yields an odour of Benzaldehyde. The amount of pure Sodium Cinnamate contained in a specimen may be quantitatively determined by titration with Tenth-normal Volumetric Sulphuric Acid Solution, using Methyl Orange Solution as an indicator of neutrality, sufficient Ether should be added to hold the liberated Cinnamic Acid in solution during the titration, and to prevent it masking the end reaction. 1 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution corresponds to 0·016883 gramme of pure anhydrous Sodium Cinnamate. Free Cinnamic Acid, if present, may be determined, previous to the above volumetric determination, by titrating with Tenth-normal Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. Each c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution used corresponding to 0·014695 gramme of absolute Cinnamic Acid. In the event of free Cinnamic Acid being present, the number of c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution required to neutralise this free Cinnamic Acid must be deducted from the total number of Tenth-normal Volumetric Sulphuric Acid Solution required to complete the titration with Methyl Orange Solution before the result is calculated into terms of Sodium Cinnamate. The aqueous solution when acidified with diluted mineral acids, though affording a white crystalline precipitate, should yield no effervescence, indicating the absence of Carbonates. If the aqueous solution be acidified with diluted Nitric Acid, and the liberated Cinnamic Acid be separated by filtration, the filtrate should yield at the most but a slight turbidity with either Silver Nitrate Solution or Barium Chloride Solution, indicating the absence of Chlorides and Sulphates.

Hetol-Caffeine (Caffeine Sodium Cinnamate).—An amorphous, bitter powder; **Heto-Cresol** (Meta-cresolic Ester of Cinnamic Acid) and **Hetoform** (Bismuth Cinnamate) are compounds which have received notice in medical literature.

INJECTIO SODII CINNAMATIS.—A sterilised 10 p.c. aqueous solution of Sodium Cinnamate.

Dose.—16 minims = 1 c.c., hypodermically.

Glycerin has been recommended as a solvent for Sodium Cinnamate. The solution can be readily sterilised, but a 10 p.c. solution, though bright when first made, soon crystallises out.

This suggestion has been incorporated in the *B.P.C.* in the form of **Glycerinum Sodii Cinnamatis**, Sodium Cinnamate, 5; Glycerin, 95.

Not Official.

SODII CITRAS.

SODIUM CITRATE.

$Na_3C_6H_5O_7\ 5\frac{1}{2}H_2O$, eq. 354·60.

A white, granular powder, possessing a cool, saline taste and a faint, caramel-like odour.

It should be kept in well-closed bottles, as it has a tendency to slowly effloresce on exposure to dry air. It dissolves 5 in 9 of Water, insoluble in Alcohol (90 p.c.), and in Ether.

Tests.—Sodium Citrate when heated loses its Water of crystallisation; when heated to dull redness it is decomposed, and on ignition leaves a carbonaceous residue which, when dissolved in Water, possesses a strongly alkaline reaction. This residue effervesces on the addition of diluted Hydrochloric Acid, and yields a solution giving the tests distinctive of Sodium mentioned under that heading. The salt dissolves readily and completely in Water, forming a clear solution slightly alkaline in reaction towards red Litmus paper, and which should not be coloured red by a drop of Phenolphthalein Solution. The aqueous solution affords upon boiling with Calcium Chloride Solution a white granular precipitate, insoluble in Potassium Hydroxide but soluble in Ammonium Chloride Solution. The *U.S.P.* requires the salt to contain not less than 97 p.c. of pure crystallised Sodium Citrate as volumetrically determined by the titration of the solution of the alkaline residue left on ignition. A weighed quantity of the salt is thoroughly charred at a dull red heat, the residue extracted with boiling Water till the washings fail to react with Methyl Orange T.S., and the mixed filtrate and washings are titrated with Semi-normal Volumetric Sulphuric Acid Solution, employing the above indicator to ascertain the point of neutrality; not less than 16·4 c.c. of the Semi-normal Volumetric Sulphuric Acid Solution should be necessary.

The more generally occurring impurities are Arsenic, Copper, Lead, Iron, Zinc and Carbonates. Arsenic, if present, may be detected by the modified Gutzeit's test. A 5 p.c. w/v aqueous solution of the salt should neither yield a distinct coloration nor turbidity on the addition of Hydrogen Sulphide to the solution acidified with diluted Hydrochloric Acid, nor a decided coloration or turbidity when the solution is subsequently made alkaline with Ammonia, indicating the absence of Copper, Lead, Iron and Zinc. A 1 in 20 aqueous solution of the salt should not yield an effervescence on the addition of a mineral acid, indicating the absence of Carbonates. The Phenolphthalein test given above also affords an indication of Carbonates, if present.

Its addition in the proportion of 1 grain to the oz., or, if necessary, 1½ to 2 grains, is found (*Pr.* lxxiv. 221) to render the curd of Milk more easily digestible, but the salt tends to produce constipation.

The addition of 1 grain to 1 oz. Milk, increased if necessary to 2 or 3 grains to the oz., renders the curd of Milk more easily digested.—*L.* '05, ii. 364. In the feeding of the infant, 1 grain to the oz. of Milk is prescribed in a teaspoonful of Water and added by the mother to the bottle before every meal.—*B.M.J.* '05, ii. 1022.

While not denying the eupeptic action which has been ascribed to this drug in infantile gastro-enteritis, its chief value (*L.* '05, ii. 192) is its power of acting as an anti-emetic in the digestive troubles of bottle-fed infants, or in those who, although suckled, vomit for no definite reason.

Good results in dyspepsia.—*L.* '07, i. 309.

Official in U.S.

SODIUM COUMARATE.—There are three isomeric Coumaric acids (ortho-, meta-, and para-), forming salts with a Sodium base, known as Sodium Ortho-Coumarate, Sodium Meta-coumarate, and Sodium Para-coumarate. The employment of the Sodium salt of Cinnamic Acid in the treatment of cancer (*L.* '02, ii. 66; *B.M.J.* '05, i. 927) has led to a search for a similar substance possessing an increased physiological action. This has been found (*B.M.J.* '05, i. 1143) in Coumaric Acid, a substance having the structure of Cinnamic Acid with a hydroxyl substituent. A 22 p.c. aqueous solution of the **Sodium Ortho-coumarate** containing a slight excess of the free Ortho-coumaric Acid was tried. The solution induced a rapid physiological action, the leucocytosis being well marked and resembling that effected by the Cinnamate. An 8 p.c. solution of the less soluble **Sodium Para-coumarate** was employed; the results tending to show the action was of a similar nature, but rather less intense than that produced by the ortho-salt.

A 20 p.c. aqueous solution of the **Sodium Meta-coumarate** was used, and showed a very marked physiological action, being apparently even more active than the ortho-compound. The three acids are certainly physiologically active, but it must be left for further experiments to decide which of these is likely to prove to be the most serviceable therapeutic agent.

Beneficial in cancer, even in cases of worst possible type.—*L.* '07, ii. 690.

SODII ETHYLATIS LIQUOR.

SOLUTION OF SODIUM ETHYLATE.

A pale yellow, viscid, alcoholic liquid, prepared by dissolving 22 grains of clean, bright, metallic Sodium in 1 fl. oz. of Absolute Alcohol, care being taken to keep the contents of the flask cool during the reaction. It is officially described as a colourless liquid, but even when freshly prepared it scarcely answers this description, being usually of a pale straw-colour, and becoming yellowish-brown on keeping, and when traces of aldehyde are present in the Alcohol the change of colour is more rapid and occurs to a much greater extent, producing a deep brown.

This solution should be recently prepared, and should be preserved in well-stoppered bottles of a dark amber tint. It contains 18 p.c. of the solid substance, C_2H_5ONa.

If the Sodium be not bright, it is advisable to wash it with a little Absolute Alcohol before commencing to make the Liquor.

Medicinal Properties.—Caustic; used in the treatment of nævus, nasal polypus, ozœna, warts and lupus.—*L.* '78, ii. 625; '81, i. 168, 242; *B.M.J.* '85, ii. 344; '88, ii. 762.

Successful in multiple circumscribed lipomata.—*L.* '07, i. 943.

It may be applied by means of a glass rod, camel's-hair brush, or a quill pen. Tincture of Opium may be added to relieve the pain, but not Chloroform, as it makes an explosive mixture.

Tests.—Sodium Ethylate Solution is required by the *B.P.* to possess the sp. gr. of 0·867. It boils when heated, emitting vapours possessing an alcoholic odour, a white residue remaining, which undergoes hydrolysis when heated with Water, yielding a solution which possesses a strongly alkaline reaction towards red Litmus paper and which produces a strong red coloration with Phenolphthalein Solution. If a portion of this solution be evaporated to dryness it leaves a residue which should answer the tests distinctive of Sodium Hydroxide given under the heading of Soda Caustica. The white residue left on the evaporation of the Alcohol chars when strongly heated.

SODII HYPOPHOSPHIS.

SODIUM HYPOPHOSPHITE.

$NaPH_2O_2$, eq. 87·44.

FR., HYPOPHOSPHITE DE SODIUM; GER., NATRIUMHYPOPHOSPHIT; ITAL., IPOFOSFITO DI SODIO; SPAN., HIPOFOSFITO SODICO.

Colourless, translucent, deliquescent, prismatic crystals, or as a white, granular powder, possessing a slightly bitterish, saline taste. It is obtained by the interaction of Sodium Carbonate and Calcium Hypophosphite.

Sodium Hypophosphite, when mixed with an equal quantity of Sodium Nitrate, forms a highly explosive mixture.—*Y.B.P.* '87, 21.

It should be kept in well-closed vessels in a cool atmosphere and protected as far as possible from contact with the air, as it is stated to be of a deliquescent nature. The crystals or powder deliquesce slowly in very hot weather, but as soon as it cools [say to 18·3° C. (65° F.)] the salt dries up again. It should be handled with caution, as it is readily oxidised, and when brought into contact with powerful oxidising agents the temperature rises so rapidly that an explosion is liable to result. The formula given in the *B.P.* shows the official salt to be anhydrous; the *U.S.P.* formula is given with 1 molecule of Water of crystallisation; the salt is not official in the *P.G.*

Solubility.—1 in 1 of Water; 1 in 2 of Glycerin; almost entirely 1 in 20 of Alcohol (p.c.).

Medicinal Properties.—Similar to those of Calcii Hypophosphis.

Dose.—3 to 10 grains = 0·2 to 0·65 gramme.

Not Official.—Syrupus Sodii Hypophosphitis.

Foreign Pharmacopœias.—Official in Belg., Dutch, Fr., Ital., Mex., Port., Span. and U.S.

Tests.—Sodium Hypophosphite when heated evolves spontaneously inflammable Hydrogen Phosphide gas and Hydrogen; the *U.S.P.* states that when heated in a test-tube the salt first loses its Water of crystallisation, and at about 200° C. (392° F.) it is decomposed, evolving Hydrogen and Hydrogen Phosphide gas, which burns spontaneously with a bright yellow flame. The salt answers the tests distinctive of Sodium given under that heading. It dissolves readily in Water, forming a clear solution which is neutral or only faintly alkaline to Litmus paper. The solution yields with warm Copper Sulphate Solution a reddish-brown precipitate of Cuprous Hydride, and on boiling evolves Hydrogen. It rapidly decolorises solution of Potassium Permanganate. The diluted aqueous solution acidulated with Diluted Sulphuric Acid yields on the addition of Silver Nitrate Solution a white precipitate rapidly turning from brown to black, owing to its reduction to metallic Silver. On the addition of Mercuric Chloride Solution to a 5 p.c. aqueous solution of the salt acidulated with Hydrochloric Acid, a white precipitate is produced, changing rapidly to grey, owing to its reduction to metallic Mercury. The *B.P.* utilises its reducing action on Potassium Permanganate Solution as a basis for a method of determination, requiring that when a weighed quantity of 0·5 of a gramme of the salt is boiled for 10 minutes with a solution of 1·15 grammes of Potassium Permanganate in 25 c.c. of Water and filtered, a nearly colourless filtrate should be yielded. No statement is made respecting the amount of pure Sodium Hypophosphite which compliance with this test indicates. It has been recommended that this Permanganate test should be replaced by one based on the work of Jowett; the method is described under Calcii Hypophosphis. The *U.S.P.* states that the salt should contain not less than 98 p.c. of pure crystallised Sodium Hypophosphite, but gives no method for its determination.

The more generally occurring impurities are Arsenic, Copper, Lead, Iron and Zinc, Calcium Magnesium, alkali or alkali Carbonate, Chlorides and Sulphates, Phosphates and Phosphites. Arsenic, if present, may be detected by the modified Gutzeit's test given in small type below under that heading; Copper, Lead, Iron and Zinc, if present, by the Hydrogen Sulphide test. The aqueous solution of the salt should afford no distinct turbidity with Ammonium Oxalate Solution after the addition of a little Ammonium Chloride Solution. If the mixture be allowed to stand for some time and filtered it should yield little or no turbidity with Sodium Phosphate Solution, indicating the absence of Calcium and Magnesium. The aqueous solution should neither be coloured red on the addition of Phenolphthalein T.S., nor should it effervesce on the addition of a diluted mineral acid. When acidified with Diluted Nitric Acid, the aqueous solution should afford no pronounced turbidity or precipitate with either Silver Nitrate Solution or Barium Chloride Solution, indicating the absence of more than traces of Chlorides and Sulphates. It is officially required to yield no precipitate with Lead Acetate Solution, indicating a limit of Phosphates and Phosphites. The remarks on the Lead Acetate test will be found under Calcii Hypophosphis.

Hydrogen Sulphide.—An aqueous solution (1-20) acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Gutzeit's Test.—If 5 c.c. of an aqueous solution of the salt (1-10) be measured into a beaker containing 3 c.c. of Nitric Acid diluted with about 10 c.c. of Water and evaporated to dryness on a water-bath, the residue should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Not Official.

SYRUPUS SODII HYPOPHOSPHITIS.—Dissolve 160 grains of Sodium Hypophosphite in 3 fl. drm. of Distilled Water, filter, and wash the filter with Distilled Water 1 fl. drm. To the filtered solution add sufficient Syrup to produce 20 fl. oz. Each fl. drm. contains 1 grain of Sodium Hypophosphite.—*B.P.C. Formulary* 1901.

Dose.—1 to 4 fl. drm. = 3·6 to 14·2 c.c.

Official in Mex.

Dissolve 2 of Sodium Hypophosphite in 2 of Distilled Water and add sufficient Syrup to the filtered solution to make 100. *B.P.C.*

SODII IODIDUM.

SODIUM IODIDE.

NaI, eq. 148·78.

Fr., Iodure de Sodium; Ger., Natriumjodid; Ital., Joduro di Sodio; Span., Yoduro Sodico.

Colourless, cubical crystals, or an odourless, white, crystalline, hygroscopic powder, possessing a somewhat bitter, saline taste. It is deliquescent in moist air, becoming partially decomposed; it should therefore be kept in well-closed bottles and in a cool place. It is officially described as a 'dry' powder, but commercial samples vary much in the proportion of Water which they contain, from 10 to 20 p.c.

Solubility.—11 in 6 of Water, and measures 10½; 1 in 3 of Alcohol (90 p.c.); 1 in 1 of Glycerin.

Medicinal Properties.—Given in the same doses as, and for purposes similar to those of, Potassium Iodide; is more readily tolerated by the stomach, and is less depressant.

5 to 10-grain doses for long continued administration, combined in the earlier stages with Ammonia, and in the later with from 3 to 5 minims of Fowler's Solution, in the treatment of pain at the heart after influenza.—*L.* '99, ii. 1081.

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Foreign Pharmacopœias.—Official in all except Port.

Tests.—Sodium Iodide melts when strongly heated. It dissolves readily in Water, forming a clear solution which is faintly alkaline to red Litmus paper. It answers the tests distinctive of Sodium given under that heading. The aqueous solution yields with Silver Nitrate Solution a yellow curdy precipitate insoluble in Nitric Acid, practically insoluble in Ammonia Solution, but soluble in Potassium Cyanide Solution. With Mercuric Chloride T.S. it yields a scarlet precipitate soluble in excess of the reagent and very soluble in excess of Sodium Iodide. With Lead Acetate Solution it yields a yellow precipitate soluble in diluted Nitric Acid, and also in boiling Water, from which solution on cooling it recrystallises in beautiful crystalline scales. When the aqueous solution is mixed with Chlorine Water it yields a reddish-brown coloration, and on shaking the liquid with Carbon Bisulphide the latter solution is coloured a deep violet tint. The dried salt is required to contain not less than 98·9 p.c. of pure Sodium Iodide as determined volumetrically by titration with Tenth-normal Volumetric Silver Nitrate Solution, *see* below under the heading Volumetric Determination. It is officially required to lose not more than 5 p.c. of Water when dried at 120° C. (248° F.). Commercial samples vary much in the proportion of Water which they contain. The *U.S.P.* requires that the salt shall contain at least 98 p.c. of pure Sodium Iodide as volumetrically determined by the method given in small type below under the heading of Volumetric Determination. It does not state a limit of loss of weight when dried. The *P.G.* requires that 100 parts shall contain at least 95 parts of anhydrous salt; the *P.G.* does not include a limit of moisture.

The more generally occurring impurities are Arsenic, Copper, Lead and Iron, Ammonium, Barium, Magnesium and Potassium, Bromates and Carbonates, Cyanides, free Iodine, Iodates, Chlorides, Bromides, Thiosulphates and Sulphates. Arsenic, Copper, Lead and Iron, if present, may be detected by the time-limit test for heavy metals mentioned in small type under the heading of Hydrogen Sulphide. The salt should not evolve an odour of Ammonia when boiled with Potassium Hydroxide Solution, nor should the issuing vapour have an alkaline reaction upon moistened red Litmus paper, indicating the absence of Ammonium salts. The aqueous solution of the salt should yield no reaction with the test for Barium described below under the heading of Potassium Sulphate. It should yield a scarcely perceptible turbidity on the addition of Ammonium Oxalate Solution, and if the mixture be set aside for some time and filtered, the filtrate should yield little or no turbidity on the addition of Sodium Phosphate Solution, indicating the absence of Calcium and Magnesium. It should afford no reaction for Potassium when examined by the test given below under the heading of Sodium Bitartrate. The *B.P.* includes a test for Bromates, presumably that mentioned in the Appendix is to be applied to this salt. Its aqueous solution should not effervesce on the addition of a diluted mineral acid, indicating the absence of Carbonate. It should yield no indication of the presence of Cyanide when examined by the test with Ferrous Sulphate, Ferric Chloride and Alkali Hydroxide described below. No indication of free Iodine should be yielded when ½ gramme of the salt is dissolved in 10 c.c. of Distilled Water, which has been previously boiled and cooled in a small flask, as indicated by the solution not acquiring a yellow tint, nor should the solution acquire a yellow colour within half a minute after an addition of 2 drops of Diluted Sulphuric Acid, indicating the absence of Iodate. Chlorides, Bromides and Thiosulphates, if present, may be detected by the test with Tenth-normal Volumetric Silver Nitrate Solution and Ammonia described below in small type. An aqueous solution of the salt should not afford a distinct turbidity with Barium Chloride Solution, indicating the absence of more than traces of Sulphates. The *U.S.P.* includes a test for limit of alkali, requiring that a drop of Phenolphthalein T.S. added to a solution of 1 gramme of the salt in Water, and containing 0·1 c.c. of Tenth-normal Volumetric Sulphuric Acid Solution should not produce a red coloration. The *P.G.* and the *U.S.P.* both include a test for Nitrates and Nitrites, that of the former Pharmacopœia fixing a limit for these impurities by the adoption of a time limit during which no coloration should become apparent; the tests are described in small type below under the headings of Aluminium Wire and Potassium Hydroxide, or Zinc filings, powdered Iron and Sodium Hydroxide; the *U.S.P.* employing the former mixture, the *P.G.* the latter. The *P.G.* includes a separate test for Iron described below under the heading of Potassium Ferrocyanide Solution. The alternative method for the determination of Potassium Iodide in a mixture of Potassium Chloride, Bromide and Iodide described under the heading of Potassii Iodidum is equally applicable in the case of the Sodium Iodide.

Hydrogen Sulphide.—An aqueous solution (1–20) should not be affected by T.S. of Hydrogen Sulphide, *P.G.*; slightly acidulated with Hydrochloric Acid it should not respond to the time-limit test for heavy metals, *U.S.P.*

Barium Nitrate.—An aqueous solution of the salt (1–20) should not be affected by T.S. of Barium Nitrate, *P.G.*

Ferrous Sulphate, Ferric Chloride, and Alkali Hydroxide.—If an aqueous solution of the salt (1–20) be gently warmed with a crystal of Ferrous Sulphate, 1 drop of Ferric Chloride T.S. and Sodium Hydroxide T.S. the mixture should not be coloured blue on supersaturating with Hydrochloric Acid, *P.G.*; 5 c.c. of the aqueous solution, gently heated with 1 drop each of Ferrous Sulphate and Ferric Chloride T.S. and 0·5 c.c. of Potassium Hydroxide T.S., should not develope a blue colour after acidulating with Hydrochloric Acid, *U.S.P.*

Sulphuric Acid.—If Starch T.S. and diluted Sulphuric Acid be added as quickly as possible to a freshly prepared solution (1–10) of the salt in previously boiled and cooled Water, the solution should not be immediately coloured, *P.G.* The *U.S.P.* states that the solution of 0·5 gramme of the salt in 10 c.c. of previously boiled and cooled Distilled Water should not have a distinct yellow tint, nor should it acquire a yellow colour within half a minute after the addition of 2 drops of Diluted Sulphuric Acid (which should be free from Sulphurous Acid or Nitrous Acid).

Phenolphthalein.—A solution of 1 gramme of the salt in Water with 0·1 c.c. of Tenth-normal Sulphuric Acid Volumetric Solution added should give no red colour with a drop of Phenolphthalein T.S. even after heating, *U.S.P.*

Sodium Bitartrate.—A solution of 1 gramme of the salt in 1 c.c. of Water should yield no precipitate with 1 c.c. of Sodium Bitartrate, *U.S.P.*

Potassium Sulphate.—10 c.c. of an aqueous solution (1–20) acidulated with Hydrochloric Acid should not be rendered turbid by the addition of 1 c.c. of T.S. of Potassium Sulphate, *U.S.P.*

Potassium Ferrocyanide.—20 c.c. of an aqueous solution (1–20) after the addition of a few drops of Hydrochloric Acid should not be rendered blue by 0·5 c.c. of Potassium Ferrocyanide, *P.G.*

Zinc Filings, Powdered Iron, and Sodium Hydroxide.—1 gramme of the salt warmed with 5 c.c. of Sodium Hydroxide T.S. and a mixture of 0·5 gramme of Zinc filings and powdered Iron, should not evolve Ammonia, *P.G.*

Aluminium Wire and Potassium Hydroxide.—If to 1 gramme of the salt contained in a test-tube of about 40 c.c. capacity, 5 c.c. of Water, 5 c.c. of Potassium Hydroxide T.S., and about 0·2 gramme of Aluminium wire be added, and if in the upper portion of the test-tube a pledget of purified Cotton be inserted, and over the mouth there be placed a piece of moistened red Litmus paper, then if the tube be heated upon a water-bath for 15 minutes, no blue coloration of the paper should be discernible, *U.S.P.*

Tenth-normal Volumetric Silver Nitrate and Ammonia.—If 0·2 gramme of the salt (dried, *P.G.*) be dissolved in 2 c.c. of Ammonia T.S. and 15 c.c. (14 c.c., *P.G.*) of Tenth-normal Silver Nitrate Volumetric Solution be added, then after thoroughly agitating and filtering, the filtrate upon supersaturating with Nitric Acid, should not become more than slightly turbid, nor should any darkening appear within 10 minutes, *P.G.* and *U.S.P.*

Volumetric Determination.—A solution of 1 gramme of the salt [dried at 120° C. (248° F.)] in Water should require the addition of not less than 66·5 c.c. of Volumetric Solution of Silver Nitrate for complete precipitation, *B.P.*; a solution of 0·5 gramme of the well dried salt in 10 c.c. of Water with about 5 drops of Potassium Chromate T.S. added, should require not more than 34·6 c.c. nor less than 33 c.c. of Tenth-normal Silver Nitrate Volumetric Solution to produce a permanent red colour (corresponding to at least 98 p.c. of pure Sodium Iodide), *U.S.P.*

Not Official.

Rubidium Iodide has been used for similar purposes to the Potassium Iodide.

Dose.—5 to 20 grains = 0·32 to 1·3 grammes.

SODII NITRIS.

SODIUM NITRITE.

$NaNO_2$, eq. 68·58.

White, or yellowish-white, fused pencils or sticks, with a crystalline fracture; or a whitish, deliquescent crystalline powder, possessing a mild, saline taste, and an alkaline reaction.

It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from contact with the air and light, it has a tendency to deliquesce and to become gradually oxidised. It is frequently found in commerce fused into sticks, with a crystalline fracture. It is prepared by fusing Sodium Nitrate with reducing substances, such as metallic Lead, Barium Sulphide, etc., but if the reduction is carried too far, free alkali is formed and afterwards becomes carbonated.

Solubility.—5 in 6 of Water, 1 in 50 of Alcohol (90 p.c.).

Medicinal Properties.—Vaso-dilator and antispasmodic. Used with the object of warding off the attack in angina pectoris and asthma, as well as relieving the symptoms during an attack; also in migraine and hemicrania if accompanied by facial pallor. It is not so rapid in its action as Amyl Nitrite, but is more persistent and more gentle. It is of great service in lowering arterial tension in renal cirrhosis.

Closely approaches the action of Nitroglycerin, but without its objectionable features.—*Pr.* xxx. 179.

1 to 4-grain doses every 3 or 4 hours combined with Aromatic Spirit of Ammonia, and sometimes with $\frac{1}{20}$ grain of Morphine Hydrochloride in angina pectoris. - *Pr.* lii. 348.

Dose.—1 to 2 grains = 0·06 to 0·13 gramme.

Official Preparation.—Used in the preparation of Liquor Ethyl Nitritis.

Antidotes.—Emetics, fresh air, recumbent position, Ergot, and Atropine.

Foreign Pharmacopœias.—Official in Swiss and U.S.

Tests.—Sodium Nitrite when heated melts, and at red heat is decomposed. It dissolves readily in Water, forming a clear solution, slightly alkaline in reaction towards red Litmus paper. It answers the tests distinctive of Sodium given under that heading. Potassium Iodide Solution and Starch Mucilage when added to an aqueous solution yield on the addition of a few drops of Diluted Sulphuric Acid a blue coloration. With Ferrous Sulphate Solution and Acetic Acid the aqueous solution affords a deep brown colour, the salt evolves red fumes when mixed with Diluted Sulphuric Acid. It is officially required to contain not less than 95 p.c. of Sodium Nitrite as gasometrically determined by measuring the quantity of Nitrous Acid gas evolved, when a solution of a weighed quantity is introduced into a nitrometer containing a saturated solution of Brine, Potassium Iodide and Diluted Sulphuric Acid, a weighed quantity of 0·1 of a gramme of the salt should liberate at the ordinary temperature 15·5° C. (60° F.) and pressure (30 in. or 760 mm. of Mercury) not less than 32·5 c.c. of gas, which should be almost completely absorbed by concentrated Ferrous Sulphate Solution. It has been suggested that the Volumetric Permanganate test is better than the gasometric method now official. This is a very appropriate recommendation, the volumetric test being readily and quickly carried out and being much better adapted to the purpose than the obsolete method of gasometric analysis. Good commercial samples commonly yield 98 p.c. of pure Sodium Nitrite. The 17th Edition of *Squire's Companion* stated that in the absence of a nitrometer it may be readily estimated with a standard solution of Potassium Permanganate, 0·1 of a gramme of pure Sodium Nitrite being equal to 29 c.c. of Tenth-normal Volumetric Potassium Permanganate Solution (containing 3·156 grammes of Potassium Permanganate in 1 litre) or to 9·1 c.c. of Liquor Potassii Permanganatis, *B.P.* The *U.S.P.* requires the salt to contain not less than 90 p.c. of pure Sodium Nitrite as volumetrically determined by the addition of an excess of Tenth-normal Volumetric Potassium Permanganate Solution, titrating the excess of the latter with Tenth-normal Volumetric Oxalic Acid Solution as described under the heading of Volumetric Determination in small type below.

The more generally occurring impurity is Lead. The *B.P.* requires that on the addition of Diluted Sulphuric Acid to the aqueous solution not more than the slightest traces of a precipitate should be produced, indicating the absence of Lead; the *U.S.P.* employs the time-limit test with Hydrogen Sulphide for the detection of heavy metals, such as Arsenic, Copper, Lead, Iron and Zinc.

Time-limit Test.—If 1 gramme of the salt be dissolved in 20 c.c. of Diluted Hydrochloric Acid, and heated sufficiently to expel the gases, the resulting solution after restoring it to its original volume should not respond to the time-limit test for heavy metals, *U.S.P.*

Volumetric Determination. If to 30 c.c. of Tenth-normal Volumetric Potassium Permanganate Solution, diluted with about 150 c.c. of Distilled Water, 5 c.c. of Sulphuric Acid and 10 c.c. of a solution of 1 gramme of Sodium Nitrite in sufficient Distilled Water to make 100 c.c. be successively added, the liquid brought to a temperature of 40° C. (104° F.) and allowed to stand for 5 minutes, not more than 3·75 c.c. of Tenth-normal Oxalic Acid Volumetric Solution should be required to decolorise the solution (each c.c. of Tenth-normal Potassium Permanganate consumed corresponding to 0·0034285 gramme of pure Sodium Nitrite, *U.S.P.*

Not Official.

SODIUM PERBORATE.—A white, crystalline substance which possesses the property of evolving Hydrogen Peroxide when dissolved in cold Water. —*B.M.J.* '05, i. 310; *P.J.* '05, i. 193.

SODIUM PHENOL SULPHO-RICINATE.—This has been used as a spray in the treatment of papillomata.—*B.M.J.* '04, ii. 1225.

SODIUM PHENYLPROPIOLATE.—Phenyl-propiolic Acid is prepared by treating Methyldibromocinnamate with alcoholic solution of Potassium Hydroxide. The pure acid has a m.p. 136° to 137° C. (276·8° to 278·6° F.). The Sodium salt is a white powder very soluble in Water. Under the name of **Thermiol** a 25 p.c. solution of this salt has been introduced into medicine. It is used as an inhalation in the form of 1 to 3 p.c. solution for tuberculosis and affections of the throat and lungs.

Not Official.

SODII OLEATIS SOLUTIO, *see* p. 824.

SODII ET POTASSII TARTRAS.

See SODA TARTARATA, p. 1088.

SODII PHOSPHAS.

SODIUM PHOSPHATE.

Na_2HPO_4, $12H_2O$, eq. 355·64.

FR., PHOSPHATE MONO-ACIDE DE SODIUM; GER., NATRIUMPHOSPHAT; ITAL., FOSFATO BISODICO; SPAN., FOSFATO SODICO.

Colourless, translucent, efflorescent, rhombic crystals, possessing a cooling taste and alkaline reaction.

There are three Sodium Phosphates, the Ortho-, Meta-, and Para-phosphates. The official salt is the Di-sodium Hydrogen Ortho-phosphate.

It should be kept in well-closed vessels and in a cool atmosphere, as it has a tendency to effloresce on exposure to air. It may be prepared by the interaction of Acid Calcium Phosphate with Sodium Carbonate. Acid Calcium Phosphate is produced on mixing Bone-ash and Sulphuric Acid.

The exsiccated salt, **Sodii Phosphas Exsiccatus,** forms an odourless white powder, which is convenient for mixing with other powders. 1 of the dried salt equals about 2 of the crystalline.

It is liable to be contaminated with Arsenic: of course only Arsenic-free samples should be used in medicine.

Solubility.—1 in 6 of Water; dissolves in its own Water of crystallisation below 212° F.; insoluble in Alcohol (90 p.c.).

Medicinal Properties.—A mild, saline purgative; from its pure saline taste it is called Tasteless Aperient Salt, and is often given to children. Diuretic, antacid and antilithic in small doses. As it renders the urine alkaline, it is sometimes useful in gout.

In a case of diabetes mellitus, 20 grains twice daily by the mouth, a solution being subsequently used hypodermically.—*B.M.J.* '03, i. 1205.

By hypodermic injection in various nervous diseases.—*B.M.J.E.* '93, ii. 108.

Incompatible with alkaloids.—*T.G.* '94, 334.

Dose.—30 to 120 grains = 2 to 8 grammes, for repeated administration; for a single administration, $\frac{1}{4}$ to $\frac{1}{2}$ an oz. = 7·1 to 14·2 grammes.

Official Preparation.—Sodii Phosphas Effervescens. Used in the preparation of Ferri Phosphas.

Not Official.—Liquor Sodii Phosphatis Compositus.

Foreign Pharmacopœias.—Official in all except Dan. and Norw.

Sodii Phosphas Exsiccatus is official in Swiss and U.S.

Tests.—Sodium Phosphate when exposed to dry air loses, according to the *U.S.P.*, 5 molecules of Water of crystallisation, equivalent to 25·1 p.c.; the *B.P.* states that when heated to a dull red heat it loses its Water of crystallisation, equivalent to 62·84 of its weight; the *U.S.P.* states that at 100° C. (212° F.) it loses all its Water of crystallisation, equivalent to 60·3 p.c. and that at a red heat it is converted into Sodium Pyrophosphate. The crystallised salt liquefies at about 40° C. (104° F.). It answers the tests distinctive of Sodium given under that heading. It dissolves readily in Water, yielding a clear solution which is slightly alkaline in reaction towards red Litmus paper. The aqueous solution yields on the addition of Silver Ammonio-nitrate Solution a light yellow precipitate readily soluble in Ammonia Solution, and in cold diluted Nitric Acid. Magnesium Ammonio-sulphate Solution yields with the aqueous solution a white crystalline precipitate soluble in diluted mineral acid. The aqueous solution containing some free Nitric Acid affords on warming with an excess of Ammonium Molybdate Solution a yellow precipitate soluble in Ammonia and reprecipitated as a white crystalline precipitate on the addition of Magnesium Ammonio-sulphate Solution. No requisite percentage of pure crystallised Sodium Phosphate is mentioned in the *B.P.*, nor is a method of determination included. The percentage of pure crystallised Sodium Phosphate present may be determined by direct titration with Normal Volumetric Sulphuric Acid Solution, employing Methyl Orange Solution as an indicator of neutrality as described under Sodii Arsenas.

On account of the high molecular weight of the salt, 3 grammes is suggested as a suitable quantity to be used for the determination. The *U.S.P.* requires that the uneffloresced salt should contain not less than 99 p.c. of pure Di-sodium Ortho-phosphate, but gives no method of determination. The *P.G.* does not state either a requisite percentage or a method of determination.

The more generally occurring impurities are Arsenic, Copper, Lead, Iron and Zinc, Ammonium, Calcium, Potassium, Carbonates, Chlorides and Sulphates. The discovery of Arsenic in the commercial salt caused a sensation in 1900, and numerous methods were suggested with a view to arriving at a satisfactory test for Arsenic. Its presence may be detected by the modified Gutzeit's test mentioned below, which is that employed by the *U.S.P.* The *P.G.* employs the Bettendorf's test given under the heading of Stannous Chloride. Standards have been suggested (*C.D.* '08, i. 796) of 5 parts per million for Lead, and 5 parts per million for Arsenic. Copper, Lead, Iron and Zinc, if present, may be detected by Hydrogen Sulphide, either in a solution rendered acid by Diluted Hydrochloric Acid or in a solution rendered ammoniacal by Ammonia Solution, as described under the heading of Hydrogen Sulphide in small type below. An aqueous solution of the salt should not afford an ammoniacal odour when boiled with Potassium Hydroxide Solution, nor should the issuing vapour possess an alkaline reaction towards a piece of moistened red Litmus paper, indicating the absence of Ammonium salts. The aqueous solution should not afford a distinct opalescence with Ammonium Oxalate Solution, indicating the absence of Calcium. It should not impart a decided violet coloration to a non-luminous flame when viewed through a piece of blue glass, indicating the absence of Potassium. It should yield no effervescence on the addition of Diluted Sulphuric Acid, indicating the absence of Carbonate. The aqueous solution when acidified with Nitric Acid should yield not more than a slight reaction for Chlorides and Sulphates when examined by the tests described below under the headings of Silver Nitrate and Barium Nitrate.

Hydrogen Sulphide.—An aqueous solution (1–20) should not be affected by T.S. of Hydrogen Sulphide, *P.G.*; slightly acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Barium Nitrate.—The aqueous solution (1–20) acidulated with Nitric Acid should not be rendered turbid more than opalescent with Barium Nitrate T.S. within 3 minutes, *P.G.*

Silver Nitrate.—An acidulated solution as above should not be rendered more than opalescent within 3 minutes by T.S. of Silver Nitrate, *P.G.*

Gutzeit's Test.—5 c.c. of an aqueous solution of the salt (1–10) should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Stannous Chloride.—A mixture of 1 gramme of previously dehydrated and powdered salt and 3 c.c. of Stannous Chloride T.S. should not assume a dark colour in the course of an hour, *P.G.*

Preparation.

SODII PHOSPHAS EFFERVESCENS. EFFERVESCENT SODIUM PHOSPHATE.

Sodium Phosphate, in crystals, 50; Sodium Bicarbonate, in powder, 50; Tartaric Acid, in powder, 27; Citric Acid, in powder, 18; made into granules, the total weight of which is about 100.

Dose.—60 to 120 grains = 4 to 8 grammes, for repeated administration; for a single administration, ¼ to ½ an oz. = 7·1 to 14·2 grammes.

Official in U.S.

Not Official.

LIQUOR SODII PHOSPHATIS COMPOSITUS.—Sodium Phosphate, 100; Sodium Nitrate, 4; Citric Acid, 13; Distilled Water, *q.s.* to make 100. Triturate the Sodium Phosphate and Sodium Nitrate with the Citric Acid until completely liquefied, then add sufficient Water to produce 100. Filter the liquid and keep it in well-stoppered bottles in a moderately warm place.—*U.S.P.*

This has been incorporated in the *B.P.C.*

Not Official.

SODII PHOSPHAS ACIDUS.

Large, translucent, rhombic crystals, readily soluble in Water. Given in cases of alkaline urine.

Results showing the power of the drug to increase the acidity of the urine.—*B.M.J.* '03, i. 1256; *L.* '03, i. 662.

Dose.—30 to 60 grains = 2 to 4 grammes every 3 hours, but it is better to give smaller quantities oftener to ensure continuous elimination.

Sodii Pyrophosphas in Swiss and U.S.

SODII SALICYLAS.

SODIUM SALICYLATE.

$NaC_7H_5O_2$, eq. 158·89.

Fr., Salicylate Neutre de Sodium; Ger., Natriumsalicylat; Ital., Salicilato di Sodio; Span., Salicilato Sodico.

There are two Sodium Salicylates, the one prepared with the 'Natural' Acid, the other with the 'Artificial' Acid.

The former is in yellowish or pinkish-white pearly scales, or as a pinkish-white amorphous powder, possessing a sweetish saline taste, and frequently a faint odour of Methyl Salicylate; the latter is in white lustrous pearly scales, or a white amorphous powder, with a sweetish saline taste. They may be obtained by the interaction of the respective Salicylic Acids and Sodium Carbonate or Sodium Hydroxide.

Both varieties should be kept in well-closed bottles of a dark amber tint.

The *B.P.* formula for the salt shows ½ a molecule of Water of crystallisation. The *U.S.P.* formula represents the salt as anhydrous, which is correct.

100 parts of Sodium Salicylate contain 86 parts of Acid Salicylic.

Solubility.—1 in 1 of Water; 1 in 5 of Alcohol (90 p.c.); 1 in 30 of Absolute Alcohol.

Medicinal Properties.—Given as a specific in acute rheumatism, in which it lowers the temperature, lessens the pain and swelling, and also the liability to complications such as pericarditis.

Occasionally used as an antipyretic in pneumonia, typhoid and all pyrexial affections. A soluble form of Salicylic Acid, and less irritating. Useful in influenza, diabetes, chronic rheumatism, sciatica and in acute tonsillitis, which is so often rheumatic in origin. One of the best antiseptics for fermentative dyspepsia. It increases the acidity of the urine. Brunton says that in obstinate constipation due to gout its administration will tend to keep the bowels regular without any purgative whatever.

Combined with Potassium Bromide, in headache, *Pr.* lii. 101; *T.G.* '94, 335; in pleuritis, *T.G.* '94, 101; reason for advantage of natural over artificial Salicylate, *Pr.* lii. i. 447; of great value in psoriasis and in many forms of erythema, especially e. nodosum, *L.* '80, i. 627; '95, i. 1422; *B.M.J.* '86, i. 737; *T.G.* '85, 446. In exophthalmic goître.—*B.M.J.E.* '95, i. 91.

As a means of diagnosis between rheumatism and gout; if the patient improved under Salicylate treatment the disease was rheumatic, if not it was gout.—*L.* '99, ii. 441.

Larger doses of the salt prepared from the 'natural' acid could be given with less ill effects.—*L.* '00, i. 1016.

In pneumonia 8 to 10 grains every 2 hours.—*Pr.* lxiv. 330.

Temporary blindness resulting from 140 to 150 grains taken over a period of 60 hours.—*B.M.J.* '01, ii. 81.

10 to 20 grains combined with 10 grains Quinine Sulphate every 4 hours in malarial fever.—*L.* '03, ii. 95, 200, 631.

In the treatment of chorea 10-grain doses with 20 grains Sodium Bicarbonate for a child of 6 to 10 years; increasing the quantities to 15 and 30 grains respectively, after 2 or 3 days; and if necessary to 20 and 40 grains respectively after a further 2 or 3 days. A careful watch is kept for any symptoms of Salicylate poisoning.—*B.M.J.* '03, ii. 451.

Has been used as an endo-articular and as an intravenous injection in sterile Water, under strict aseptic precautions, in cases of acute articular rheumatism. —*M.P.* '04, ii. 472; *B.M.J.E.* '04, ii. 60.

Intravenous injection of 2 c.c. of Mendel's mixture, the latter containing 17·5 p.c. of Sodium Salicylate and 2·5 p.c. Caffeine; in the treatment of rheumatic affections. When injected into the veins one sees the specific action of Salicylates in rheumatism at its best.—*B.M.J.E.* '05, i. 43.

Very beneficial in posterior urethritis.—*F.T.* '07, 84. No need to discontinue it during pericarditis.—*B.M.J.* '07, i. 814.

Dose.—10 to 30 grains = 0·65 to 2 grammes.

Prescribing Notes.—*Best given in* **solution** *well diluted, to avoid dyspepsia, but may also be prescribed in* **cachets** *or* **powders**. *When dissolved in Water and mixed with Ammonia, the solution soon becomes yellow or brown on exposure to the air, which happens in mixtures containing the salt and Aromatic Spirit of Ammonia when the bottle is half full. It is sometimes prescribed with Citric Acid, which precipitates the Salicylic Acid. It is better to give it with Sodium or Potassium Citrate. When prescribed with a salt of Quinine, Quinine Salicylate is formed, which is only slightly soluble, and is therefore thrown out.*

Official Preparation.—Used in the preparation of Bismuthi Salicylas.

Foreign Pharmacopœias.—Official in all the Foreign Pharmacopœias except Port. Dutch has also Salicylas Natricus cum Coffeino.

Tests.—Sodium Salicylate when heated emits white inflammable vapours, possessing an odour of Phenol, leaving a carbonaceous residue, which, when dissolved in Water, produces a solution having a strong alkaline reaction towards red Litmus paper, and which effervesces on the addition of a diluted mineral Acid. It dissolves readily in Water, forming a clear solution which is neutral to Litmus paper or only faintly acid towards blue Litmus paper. The *B.P.*

states that a concentrated aqueous solution affords with Ferric Chloride T.S. a reddish-brown coloration, and a diluted aqueous solution a violet coloration with the same reagent. The *U.S.P.* states that Ferric Chloride T.S. added to an excess of a concentrated aqueous solution of the salt produces a violet precipitate, but when added to a diluted solution (1 in 100) it produces a deep violet-blue colour; the *P.G.* states that a 1 in 1000 aqueous solution affords a bluish-violet coloration on the addition of Ferric Chloride T.S. A 1 in 20 aqueous solution affords a green coloration with Copper Sulphate T.S. A 10 p.c. aqueous solution yields on the addition of Diluted Sulphuric Acid a white crystalline precipitate readily soluble in Ether. If the precipitate produced on acidification be separated by filtration, washed and carefully dried, it should possess the m.p. and answer the tests distinctive of Salicylic Acid given under Acidum Salicylicum. A small quantity of the salt, when warmed with a little concentrated Sulphuric Acid and a few drops of Methyl Alcohol, evolves a distinctive odour of Methyl Salicylate. Neither the *B.P.* nor the *P.G.* states what percentage of pure Sodium Salicylate should be present in the salt, nor does either give a method of determination. It may be determined by titration of the solution of the residue left on ignition, with Normal Volumetric Sulphuric Acid Solution, using Methyl Orange Solution as an indicator of neutrality; 1 c.c. of the Normal Volumetric Acid Solution being equivalent to 0·15889 gramme of pure Sodium Salicylate. The *U.S.P.* requires it to contain 99·5 p.c. of pure Sodium Salicylate as volumetrically determined by titrating the solution obtained by exhausting the residue left on thoroughly igniting the salt at a red heat, with boiling Water, until the washings cease to react with Methyl Orange Solution as described in small type below under the heading Volumetric Determination.

The more generally occurring impurities are Arsenic, Copper, Lead, Iron and Zinc, Chlorides, Sulphates and Sulphites, organic impurities and Carbonates, unconverted Phenol, and isomers or homologues of Salicylic Acid. Copper, Lead, Iron and Zinc, if present, are indicated by the time-limit test described under the heading of Hydrogen Sulphide. When Diluted Nitric Acid is added in slight excess to an aqueous solution of the salt and the precipitated Salicylic Acid is removed by filtration, the filtrate should yield only a slight turbidity on the addition of Silver Nitrate Solution or Barium Chloride Solution, indicating the absence of more than traces of Chlorides and Sulphates. The *B.P.* states that if the aqueous solution be acidulated with Nitric Acid and the precipitate be dissolved with a little Alcohol (90 p.c.) the mixture affords not more than the slightest reactions with the tests for Sulphates or for Chlorides. The word 'acidulated' should be 'supersaturated,' as sufficient Nitric Acid over and above that necessary to completely decompose the Sodium Salicylate must be added in order to prevent the precipitation of Silver Salicylate. If a 5 p.c. aqueous solution of the salt be mixed with a few drops of Iodine T.S. and a few drops of Hydrochloric Acid, the filtrate should yield no precipitate upon the addition of

Barium Chloride Solution, indicating the absence of Sulphites. The salt should dissolve without coloration and without effervescence in cold Sulphuric Acid, indicating the absence of organic impurities and of Carbonates. The concentrated aqueous solution, when shaken with an equal volume of Ether, and the ethereal solution allowed to evaporate spontaneously, the residue should be free from any odour of Phenol. The *B.P.* states that 50 to 100 grammes of the salt, kept in a closed vessel for several days, should not evolve the faintest odour of Phenol. Isomers and homologues of Salicylic Acid can be detected, if present, by their influence on the m.p. of the acid separated from the salt on acidification. The *B.P.* includes a test for distinguishing Salicylates from Carbolates and Sulphocarbolates. A solution containing not less than 1 p.c. is stated to afford a yellowish-brown precipitate with Uranium Nitrate Solution. Carbolates and Sulphocarbolates presumably afford no precipitate with Uranium Nitrate Solution; it is difficult, therefore, to gauge the value of this test, as it will certainly not detect the presence of Carbolates and Sulphocarbolates in the Salicylate. The test also appears under Acidum Salicylicum, and is commented upon in large type under the heading of Tests.

Sulphuric Acid.—The salt is soluble without effervescence or coloration in cold Sulphuric Acid, *B.P.* and *P.G.*; the *P.G.* uses 0·1 gramme of salt and 1 c.c. of acid.

Hydrogen Sulphide.—An aqueous solution (1–20) should not be affected by T.S. of Hydrogen Sulphide, *P.G.*; acidulated with Hydrochloric Acid and filtered, the filtrate should not respond to the time-limit test for heavy metals, *U.S.P.*

Silver Nitrate.—2 volumes of an aqueous solution (1–20) mixed with 3 volumes of Alcohol (90 p.c.) and acidified with Nitric Acid should not be affected by T.S. of Silver Nitrate, *P.G.* Also given in *B.P.* without quantities.

Barium Nitrate.—An aqueous solution (1–20) should not be affected by T.S. of Barium Nitrate, *P.G.* The *B.P.* directs the addition of Nitric Acid and Alcohol, as in the Silver Nitrate test, and uses Barium Chloride Solution.

Iodine and Barium Chloride.—If to an aqueous solution of the salt (1–20) 3 drops of Iodine T.S. and a slight excess of Hydrochloric Acid be added, the filtrate from this mixture should not yield a precipitate upon the addition of T.S. of Barium Chloride, *U.S.P.*

Volumetric Determination.—If 1 gramme of the dry salt be thoroughly ignited at a red heat, and the residue extracted with boiling Distilled Water until the washings cease to react with Methyl Orange T.S., the mixed filtrate and washings should require for complete neutralisation not less than 12·5 (12·52) c.c. of Semi-normal Volumetric Sulphuric Acid Solution, Methyl Orange T.S. being used as indicator, *U.S.P.*

Not Official.

SODII DITHIO-SALICYLAS (Dithion).—A yellowish-white, amorphous, somewhat hygroscopic powder, antiseptic and antipyretic. Used in the form of powder, solution or ointment. Has been found useful in the treatment of rheumatism.

Dose.—1 to 3 grains = 0·06 to 0·2 gramme.

Liquor Natrii Silicici (Soluble Glass) is official in Austr. and Ger.

SODII SULPHAS.

SODIUM SULPHATE.

$Na_2SO_4 10H_2O$, eq. 319·90.

FR., SULFATE DE SODIUM OFFICINAL; GER., NATRIUMSULFAT;
ITAL., SOLFATO DI SODIO; SPAN., SULFATO SODICO.

Colourless, transparent, efflorescent, monoclinic prisms, having a bitter, cooling, saline taste.

It should be kept in well-closed vessels and in a cool atmosphere, as it is readily effloresced on exposure to air, losing its Water of crystallisation.

Sodii Sulphas Exsiccatus, is an odourless white powder, 1 of which equals 2¼ of the crystalline salt. Much more convenient than the crystals for mixing with other powders.

Solubility.—1 in 3 of Water, and measures 3½; 10 in 3 of Water at 92° F.; 10 in 4½ of Water at 212° F.; insoluble in Alcohol (90 p.c.).

Medicinal Properties.—Hydragogue purgative and cholagogue; useful in cases of gall-stones and of liver disease; in small repeated doses it is especially well adapted for cases of constipation associated with gout and hepatic dyspepsia.

Given in 1-drm. doses in either Fennel or Cinnamon Water 4, 5 or 6 times a day in the treatment of dysentery.—*I.M.G.* '05, ii. 280. In acute cases no drug is known which acts so rapidly, painlessly, or so effectually.

Dose.—30 to 120 grains = 2 to 8 grammes, for repeated administration; for a single administration, ¼ to ½ an ounce = 7·1 to 14·2 grammes.

Official Preparation.—Sodii Sulphas Effervescens.

Not Official.—Pulvis Sodii Sulphatis et Zingiberis, Pulvis Salis Carolini Factitii Effervescens, Sal Carolinum Factitium.

Foreign Pharmacopœias.—Official in Hung. (Natrium Sulfuricum Crystallisatum), also Siccum; Dan., Dutch, Norw. and Swed. (Sulphas Natricus); Dan. and Swed., also Siccatus; Dutch, also Exsiccatus; Fr. Sulfate de Sodium Officinal); Austr., Belg., Jap. and Swiss (Natrium Sulphuricum), also Siccum; Ital. (Solfato di Sodio); Mex. (Sulfato de Sodio); Port. (Sulphato de Soda); Russ. (Natrium Sulfuricum), Depuratum, and Siccum; Span. (Sulfato Sodico); U.S.

Tests.—Sodium Sulphate melts when heated. The *U.S.P.* says the salt fuses at 33° C. (91·4° F.). When dried at 100° C. (212° F.) it loses the whole of the Water of crystallisation, equivalent to 55·9 p.c.; the *B.P.* states when exposed to heat in a porcelain crucible, but gives no indication as to the temperature. It answers the tests distinctive of Sodium given under that heading. It dissolves readily in Water, forming a clear solution which is neutral in reaction towards Litmus paper, and which, on the addition of Barium Chloride Solution, yields a white precipitate insoluble in Hydrochloric Acid. It is officially required to contain 100·0 p.c. of pure crystallised Sodium Sulphate, as gravimetrically determined by precipitating the aqueous solution of 1 gramme of the salt, acidulated with Hydrochloric Acid, with Barium Chloride Solution; the white precipitate produced, when well washed and dried, should weigh 0·725 of a gramme. The *U.S.P.*

requires the salt to contain in an uneffloresced condition not less than 99 p.c. of pure crystallised Sodium Sulphate, but no method of determination is given. The *P.G.* does not state either a percentage or a method of determination.

The more generally occurring impurities are Arsenic, Copper, Lead and Iron, Ammonium, Calcium, Magnesium and Potassium, Carbonates and Chlorides. The *B.P.* includes also a test for Aluminium, an impurity of comparatively trivial importance, but omits a test for Arsenic, a much more likely one to be found and one possessing much greater importance. The presence of Arsenic much in excess of 1 in 100,000 is indicated by the sample responding to the modified Gutzeit's test described below. The *P.G.* employs the Bettendorf test for Arsenic with Stannous Chloride Solution. Standards have been suggested (*C.D.* '08, i. 796) of 5 parts per million for Lead, and 2 parts per million for Arsenic. Copper, Iron and Lead, if present, may be indicated by the coloration produced by Hydrogen Sulphide in either a solution slightly acidified with Hydrochloric Acid or a solution made slightly alkaline with Ammonia. The *P.G.* includes a separate test for Iron described below under the heading of Potassium Ferrocyanide. The aqueous solution of the salt should not afford an ammoniacal odour when boiled with Liquor Potassæ, nor should the issuing gas possess an alkaline reaction towards moistened red Litmus paper, indicating the absence of Ammonium salts. It should yield no turbidity with Ammonium Oxalate Solution, indicating the absence of Calcium, and when to the mixture is added Ammonium Chloride, allowed to stand some time and filtered, the filtrate should not yield a turbidity on the addition of Sodium Phosphate Solution, indicating the absence of Magnesium. When viewed through a piece of blue glass no violet coloration should be imparted to a non-luminous flame when a crystal of the salt moistened with Hydrochloric Acid is introduced, indicating the absence of Potassium. A strong aqueous solution of the salt should yield no effervescence on the addition of Hydrochloric Acid, indicating the absence of Carbonates. When acidified with diluted Nitric Acid it should yield no decided turbidity on the addition of Silver Nitrate Solution, indicating the absence of more than traces of Chlorides. Excess of moisture may be detected by a loss on drying at 100° C. (212° F.) as described above.

Hydrogen Sulphide.—An aqueous solution (1–20) should not be affected by T.S. of Hydrogen Sulphide, *P.G.*; slightly acidulated with Hydrochloric Acid should not respond to the time-limit test for heavy metals, *U.S.P.*

Sodium Phosphate.—An aqueous solution (1–20), after the addition of Ammonia T.S. should not be affected by T.S. of Sodium Phosphate, *P.G.*

Silver Nitrate.—An aqueous solution (1–20) should not undergo any change within 5 minutes on the addition of T.S. of Silver Nitrate, *P.G.*

Potassium Ferrocyanide.—20 c.c. of an aqueous solution (1–20) should not be affected by 0·5 c.c. of T.S. of Potassium Ferrocyanide, *P.G.*

Gutzeit's Test.—5 c.c. of the aqueous solution (1–10) should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Stannous Chloride.—A mixture of 1 gramme of previously dried and powdered Sodium Sulphate, and 3 c.c. of Stannous Chloride T.S. should not assume a dark colour in the course of an hour, *P.G.*

Preparation.

SODII SULPHAS EFFERVESCENS. EFFERVESCENT SODIUM SULPHATE.

Sodium Sulphate, in crystals, 50; Sodium Bicarbonate, in powder, 50; Tartaric Acid, in powder, 27; Citric Acid, in powder, 18; made into granules, the total weight of which is about 100. (1 in 2)

Dose.—60 to 120 grains = 4 to 8 grammes, for repeated administration; for a single administration, $\frac{1}{4}$ to $\frac{1}{2}$ an ounce = 7·1 to 14·2 grammes.

Not Official.

PULVIS SODII SULPHATIS ET ZINGIBERIS.—Sodium Sulphate, in powder, 60 grains; Ginger, in powder, 5 grains; mix.

To be taken in a small tumbler of warm Water, in the morning.

PULVIS SALIS CAROLINI FACTITII EFFERVESCENS (Effervescent Powder of Carlsbad Salt).—Dried Sodium Sulphate, 11 oz.; Powdered Potassium Sulphate, $\frac{1}{2}$ oz.; Sodium Chloride, 4$\frac{1}{2}$ oz.; Sodium Bicarbonate, 54 oz.; Tartaric Acid, 40 oz.; Gluside, 28 grains. Dry separately, reduce to fine powder and mix. —*B.P.C. Formulary* 1901.

Dose.—60 to 120 grains = 4 to 8 grammes.

Exsiccated Sodium Sulphate, 9; Sodium Potassium Tartrate, 38; Sodium Chloride 3; Sodium Bicarbonate, 33; Gluside 0·05; Tartaric Acid, *q.s.* to produce 100.—*B.P.C.*

SAL CAROLINUM FACTITIUM.—Dry Sodium Sulphate, 22; Potassium Sulphate, 1; Sodium Chloride, 9; Sodium Bircarbonate, 18.—*Ger.*

This has been incorporated in the *B.P.C.*

Dry Sodium Sulphate 47, Potassium Sulphate 2, Sodium Chloride 15, Sodium Bicarbonate 36.—*Jap.*

SODII SULPHIS.

SODIUM SULPHITE.

$Na_2SO_37H_2O$, eq. 250·38.

Colourless, transparent, efflorescent, monoclinic prisms, having a cooling saline and sulphurous taste. It can be prepared by interaction of Sulphurous Acid and Sodium Carbonate.

It should be preserved in well-closed bottles and kept in a cool place, as both the crystals and aqueous solutions are liable to oxidation on exposure to air.

Solubility.—3 in 4 of Water; insoluble in Alcohol (90 p.c.); 1 in 25 of Glycerin.

Medicinal Properties.—Antiseptic; given with success in fermentative vomiting and dilated stomach due to sarcina ventriculi. Externally as a lotion in parasitic cutaneous affections,

Dose.—5 to 20 grains = 0·32 to 1·3 gramme.

Incompatibles. Mineral Acids.

Not Official.—Liquor Sodii Sulphitis Benzoicus, Sodium Thiosulphate and Lotio Sodii Hyposulphitis.

Foreign Pharmacopœias.—Official in Mex., Port. and U.S.

Tests.—Sodium Sulphite when gently heated gradually loses its Water of crystallisation, and at a temperature of a little above 100° C. (212° F.) it loses its Water of crystallisation, equivalent to 50 p.c. It answers the tests distinctive of Sodium given under that heading. It dissolves readily in Water, yielding a solution which is usually faintly alkaline towards red Litmus paper. The *U.S.P.* states that it is neutral or feebly alkaline to Litmus paper. It evolves on the addition of Hydrochloric Acid a colourless gas possessing the characteristic pungent odour of burning Sulphur. On the addition of Zinc and Hydrochloric Acid it evolves the characteristic odour of Hydrogen Sulphide, and if a piece of filter paper moistened with Lead Acetate Solution be suspended in the neck of the tube it acquires a black colour. Iodine Solution added to an acidified solution is instantly decolorised. It is officially required to contain not less than 97·3 nor more than 102·3 p.c. of pure crystallised Sodium Sulphite as volumetrically determined by the method given below under the heading of Volumetric Determination. The *U.S.P.* requires that it should contain in the uneffloresced and air-dried condition not less than 94 p.c. of pure Sodium Sulphite as volumetrically determined by the method also given below in small type under the heading of Volumetric Determination. The salt is not official in the *P.G.*

The more generally occurring impurities are Arsenic, Copper, Lead and Iron, Chlorides, Sulphates and Thiosulphates. The *B.P.* includes only a test for the latter, the *U.S.P.* tests for the heavy metals and Thiosulphates. Arsenic, Copper, Lead and Iron, if present, may be detected by the Hydrogen Sulphide test described below. The strongly acidified aqueous solution of the salt should yield no decided turbidity on the addition of Silver Nitrate T.S., indicating the absence of more than traces of Chlorides. It should not yield a pronounced turbidity on the addition of Barium Chloride Solution to an aqueous solution strongly acidified with Hydrochloric Acid, indicating the absence of more than traces of Sulphates. The aqueous solution when treated with Hydrochloric Acid should not become cloudy, indicating the absence of Thiosulphate. The *U.S.P.* employs diluted Nitric Acid as a test for the absence of Thiosulphate, when heated sufficiently to expel the gases, no turbidity should appear.

Time-limit Test.—A solution of 1 gramme in 20 c.c. of Diluted Hydrochloric Acid after heating sufficiently to expel the Sulphur Dioxide, and restoring the solution to its orignal volume, should not respond to the time-limit test for heavy metals, *U.S.P.*

Volumetric Determination.—A solution of 1 gramme of the salt in 50 c.c. of Water should decolorise not less than 77·7 nor more than 81·7 c.c. of Volumetric Solution of Iodine, *B.P.* If to 50 c.c. of Tenth-normal Iodine Volumetric Solution measured from a burette into a glass-stoppered vial (of about 100 c.c. capacity), 0·5 gramme of the finely-powdered crystals of Sodium Sulphite be added, after solution has taken place, not more than 12·45 c.c. of Tenth-normal Volumetric Sodium Thiosulphate Solution should be required to discharge the colour of the solution, *U.S.P.*

Not Official.

LIQUOR SODII SULPHITIS BENZOICUS.—Sodium Sulphite, 30; Benzoic Acid, 14; Water, 500. An **Antiseptic solution**, recommended by Heckel.

SODIUM THIOSULPHATE (Sodium Hyposulphite $Na_2S_2O_3$, $5H_2O$, eq. 246·44).—Colourless transparent monoclinic prisms, possessing a cooling and somewhat bitter, sulphurous taste. Soluble 5 in 3 of Water; insoluble in Alcohol (90 p.c.). It is seldom used internally as a medicinal agent, but on account of its poisonous influence on the sarcina ventriculi which attends yeasty vomiting it has been employed in that complaint. Externally in the form of a 12½ p.c. solution it has been used in parasitic diseases. It is used for removal of stains produced by Silver salts and in volumetric analysis.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Foreign Pharmacopœias.—Official in Fr., Ger., Swiss and U.S.

Lotio Sodii Hyposulphitis.—Sodium Hyposulphite, 1 drm.; Water, to 1 fl. oz.—*St. John's.*

SODII SULPHOCARBOLAS.

SODIUM SULPHOCARBOLATE.

$NaC_6H_4(OH)SO_3,2H_2O$, eq. 230·44.

Colourless, translucent, slightly efflorescent rhombic crystals, possessing at first a saline and subsequently a slightly bitter taste. It may be prepared from Para-phenol-sulphonic Acid obtained by dissolving Phenol in excess of Sulphuric Acid, by converting it into a Sodium salt.

It should be kept in well-stoppered glass bottles and in a cool atmosphere, as it has a tendency to effloresce in dry air.

The Sulphocarbolates used in medicine are defined as the salts of Para-phenol-sulphonic Acid. The action of Sulphuric Acid upon Carbolic Acid results in a mixture of Para- and Ortho-phenol-sulphonic Acids, the proportion of the latter being less the higher the temperature, and the longer continued the contact. To eliminate the Ortho salt further purification is necessary.

Solubility.—1 in 6 of Water; 1 in 150 of Alcohol (90 p.c.); 1 in 5½ of Glycerin.

Medicinal Properties.—Antiseptic, given in cases of flatulence, fermentative dyspepsia, and other conditions in which Carbolic Acid is used.

Dose.—3 to 15 grains ≐ 0·2 to 1 gramme.

Incompatibles.—Ferric salts.

Foreign Pharmacopœias.—Official in Jap. and U.S. (Sodii Phenolsulphonas).

Tests.—Sodium Sulphocarbolate when heated at a temperature slightly above 100° C. (212° F.) loses its Water of crystallisation, equivalent to 15·5 p.c. When more strongly heated it evolves inflammable vapours possessing a characteristic odour of Phenol, and when ignited leaves a residue of Sodium Sulphate, equivalent to 30·6 p.c. of its original weight. This residue answers the tests distinctive of Sodium given under that heading, and when dissolved in Water yields with Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid. The salt dissolves readily in Water, yielding a solution which is neutral in reaction towards Litmus paper. A diluted aqueous solution of the salt yields on the addition of Ferric Chloride T.S. a violet coloration. The *B.P.* does not state what percentage of the pure salt it should contain, nor does it include a method of determination. The *U.S.P.* requires that it should contain not less than 99 p.c. of pure crystallised Sodium Para-phenol-sulphonate, and, although it does not indicate a direct determination to be made, states that the residue of Sodium Sulphate left on ignition should amount to 30·6 p.c.

The more generally occurring impurities are Arsenic, Copper, Lead, Iron and Sulphates. The presence of Arsenic may be ascertained by the modified Gutzeit's test or by the test with Hydrogen Sulphide described below. The latter test when applied either in solution slightly acidified with diluted Hydrochloric Acid or in a solution rendered alkaline with Ammonia, serving to detect also Copper, Lead and Iron. The aqueous solution of the salt should not at once be rendered turbid by Barium Chloride Solution, indicating the absence of Sulphates. The *U.S.P.* states that a diluted solution of the salt (1 in 100) remains clear on the addition of Barium Chloride T.S. The *B.P.* states that it may be distinguished from Salicylate by not yielding a yellowish-brown precipitate with Uranium Nitrate Solution. The criticisms on this latter test will be found under the headings Acidum Salicylicum, Sodii Salicylas.

Time-limit Test.—The aqueous solution of the salt (1–20), slightly acidulated with Hydrochloric Acid, should not respond to the time-limit test for heavy metals, *U.S.P.*

Not Official.

SODII SULPHOVINAS.

SODIUM SULPHETHYLATE.

Translucent, hexagonal crystals, or as a white, granular powder; very hygroscopic, and should be kept in well-stoppered bottles. It is soluble in Water, in dilute Alcohol and in Glycerin. Used as a mild aperient.

Dose.—½ to 1 oz. = 14·2 to 28·4 grammes.

Not Official.

SODII TAUROCHOLAS.

A yellow or yellowish-brown, amorphous, granular, hygroscopic powder; or a brown or blackish-brown, sticky, resinous mass. Soluble 2 in 1 of Water, partially soluble in Alcohol (90 p.c.). It is best prepared from pig's bile.

It should be kept in well-closed bottles and in a cool place.

Given in gouty obesity and dyspepsia, 4 grains immediately after each meal. The **pills** should be coated with Keratin.

Dose.—2 to 6 grains = 0·13 to 0·4 gramme made into **pill** with Alcohol (60 p.c.).

Tests.—Sodium Taurocholate on ignition yields a carbonaceous residue, possessing, when dissolved in Water, a strong alkaline reaction towards red Litmus paper, and effervesces on the addition of Hydrochloric Acid. It answers the tests distinctive of Sodium given under that heading. The salt dissolves readily in Water, yielding a solution which affords a precipitate on the addition of Ammonia Solution and basic Lead Acetate. Taurocholic Acid may be determined by the amount of Sulphur which it contains. A weighed quantity of the salt is moistened with fuming Nitric Acid and evaporated to dryness on a water-bath, the residue is dissolved in Water, the solution filtered and precipitated by the addition of Barium Chloride Solution; when the precipitate is filtered off, washed, dried, ignited and weighed; 1 part of Barium Sulphate corresponding to 2·16 parts of Taurocholic Acid.

Acidum Taurocholicum (Taurocholic Acid) forms deliquescent silky needles, readily soluble in Water and in Alcohol (90 p.c.).

Sodii Glycocholas occurs together with the above salt in ox bile. It may be obtained in the form of stellate needles. It is given in gouty obesity and dyspepsia, and has been found to possess considerable cholagogue action.

Dose.—2 to 10 grains = 0·13 to 0·65 gramme.

Not Official.

SODII VANADAS.

White or yellowish-white, odourless, granular powder, soluble 2 in 1 of Water; insoluble in Alcohol (90 p.c.).

Stimulates the gastric mucosa, increases the appetite and improves the general condition.—*B.M.J.E.* '01, ii. 88; *C.D.* '02, i. 638.

Dose.—$\frac{1}{64}$ to $\frac{1}{25}$ grain = 0·001 to 0·0027 gramme.

Iron Meta-vanadate, a dark, greyish-brown powder, insoluble in Water and in Alcohol (90 p.c.); and **Lithium Meta-vanadate,** a yellowish-white crystalline powder, soluble in Water, have also been prepared.

SOLUBILITY.

The importance of the subject of solubility to medical men was recognised as far back as 1864, by the late Peter Squire, and consequently this has been a feature of Squire's *Companion* to the *B.P.* since the first edition. The several paragraphs appearing under this title are probably of more use to the prescriber and dispenser than any others that appear in a book of this kind. The prescriber is constantly wishing to know whether a given substance will dissolve in some liquid which he desires to use, and to what extent. It is obvious that an error stating the substance to be more soluble than it really is causes more trouble and dissatisfaction than an error in the opposite direction, but the figures should at least be approximately correct. Prior to 1885 very few substances were given solubility figures in the *B.P.*, but subsequently these were very much enlarged.

Figures for the solubility of the various substances have been given in the *Companion* since its first issue in 1864, and these have been revised and supplemented from time to time in subsequent editions, from experiments made for that purpose. In most instances the figures have been ascertained by adding the solid substance in fine powder to a liquid, and shaking it at intervals during 3 days at a temperature between 58° and 62° F. (14·4° and 16·6° C.). They represent the weight of a solid in grammes, and the measure of a fluid in c.c. Some liquids are stated to be miscible in all proportions; this has been ascertained by adding to 5 c.c. of one fluid, small quantities of the other fluid, $\frac{1}{10}$ c.c. at first, and afterwards $\frac{1}{2}$ c.c. until 20 c.c. have been added, shaking the mixture after each addition, the temperature of the mixture being kept inside the limits given above. At the instance of the Pharmacopœia Committee of the General Medical Council a large number of experiments were made in the Research laboratory of the Pharmaceutical Society, with a view to determining the accuracy or otherwise of the solubilities of chemicals mentioned in the British Pharmacopœia, and the results were fully reported and a comparison made with authoritative statements.—*P.J.* '00, ii. 190; '01, i. 774, 806; '02, i. 510, 532, 551. These reports have been closely criticised and compared with

Squire's *Companion* figures in a series of papers by the author and C. M. Caines, communicated to the *Pharmaceutical Journal* and to the *Chemist and Druggist*.

Out of a number of determinations, amounting in the aggregate to 91 figures, 74 are almost identical, 12 are within the range of individual experimental error and variations in commercial samples. In 3 cases Squire's *Companion* figures represent the solubility in Alcohol (88·7 p.c.) of the *B.P.* '85, instead of the Alcohol (90 p.c.) in the *B.P.* '98, and in the remaining 2 instances the Research laboratory figures are shown to be incorrect.—*C.D.* '02, ii. 944; '05 i. 783; *P.J.* '03, i. 65; '05, i. 720. The concluding report from the Research laboratory on the solubility of chemical substances mentioned in the British Pharmacopœia (*P.J.* '03, ii. 881, 945) states that the further experiments confirm the results obtained by Squire and Caines. A short reference also appears under the individual heading of each substance, and will be found in the large type under Ammonii Phosphas and Zinci Sulphocarbolas.

In the Continental Pharmacopœias solubility figures are usually expressed in parts by weight, and this fact is frequently overlooked when such figures are noted by other workers. In the case of liquids lighter or heavier than Water the difference may be considerable. For instance, in a communication from the Research laboratory (*P.J.* '03, ii. 946), 'A comparison with authoritative statements,' shows an apparent discrepancy between the figures given in the British and German Pharmacopœias for the solubility of Phenacetin in Alcohol (90 p.c.) 1 in 20 and 1 in 16 respectively, whereas the British being given by volume and the German by weight, the figures are in perfect accord. It would have been advisable (*P.J.* '05, i. 720) to insert the sp. gr. of the menstruum and the words 'by weight' against the Continental authority. The figures given in the *8th Decennial Revision of the U.S.P.* represent those obtained at a temperature of 25° C. (77° F.). It is stated in the preface that this temperature was adopted for solubilities after much discussion, because it is believed that it will be generally more satisfactory throughout the United States than the former temperature of 15° C. (59° F.); the average temperature of laboratories and stores in the United States throughout the year being nearer 25° C. (77° F.) than 15° C. (59° F.). The above requires to be carefully noted, more particularly in instances where comparisons are being made between figures appearing in books of recognised standing, and more especially in books of reference where the figures are not the result of actual experiment, but consist of a mere compilation. An instance readily occurs in the case of a recently published text-book: it had evidently been held necessary, where figures for the solubility of an individual substance in a certain menstruum were not available in one book, to incorporate figures obtained from another reliable source, and for the accuracy and uniformity of the system the importance of the above caution cannot be over-estimated. Thus figures for the solubility of Terpene Hydrate, 1 in 280 of Water, 1 in 14 of Alcohol (90 p.c.), 1 in 46 Alcohol (60 p.c.), 1 in 32 boiling Water, 1 in 2 of boiling Alcohol, 1 in 100 of Ether, and 1 in 200 of Chloroform may be of considerable utility with a definite knowledge that they are the results of determinations made at two different temperatures, but when they are definitely stated all to refer to determinations made at 15·5° C. (60° F.), whereas in reality they are the result of two different systems, their misleading nature is apparent. The strength of the menstruum used is also a matter of importance. The solubility of some official substances has been shown (*P.J.* '05, i. 720) to vary considerably where Alcohol (88·7 p.c.) of *B.P.* 1885 or Alcohol (90 p.c.) of the *B.P.* 1898 is used as a menstruum, how much more so then is the solubility likely to vary when Alcohol (94·9 p.c.) of the *U.S.P.* is mistaken for Alcohol (90 p.c.) of the *B.P.* Again the Ether official in the *B.P.* refers to Ether, sp. gr. 0·735. Ether (*U.S.P.*) refers to an Ether corresponding to the sp. gr. 0·720 of the *B.P.*, which is another point likely to make a considerable difference, as will be seen by a reference to the note appearing under the solubility of Citric Acid and Tartaric Acid. In addition to substances of official origin, it is frequently necessary to consult figures for the determinations of substances of unofficial origin. A very large number of such determinations have been carried out in the author's laboratory, and the results of these determinations have been incorporated in a series of papers appearing in the pharmaceutical press (*C.D.* '05, i. 783; *P.J.* '05, i. 720, 784).

Not Official.

SOMATOSE.

A light, white or greyish powder, stated to be prepared from fresh meat; soluble in Water, and consisting of a mixture of deutero- and hetero-Albumoses.

Denaeyer states that it is neither Albumose nor a peptone, but has the characters of an alkali-albumen. This statement is partially confirmed by Allen.

A true meat nutrient, possessing restorative and stimulating powers, being well borne by delicate patients. Has a favourable effect on general metabolism. Produces no irritant effect on the kidneys and it never gives rise to albuminuria, albumosuria or peptonuria.—*L.* '99, ii. 885.

Doses of 12 grains, useful in secondary syphilis, and in the anæmia caused by malaria.—*B.M.J.E.* '99, i. 16.

Recommended in anæmia, in intestinal disorders, and in dyspepsia.

Liquid Somatose is given in teaspoonful doses to adults.

Iron Somatose.—Is a light brown, almost tasteless powder, soluble in aqueous liquids. It contains 2 p.c. of Iron, and has been recommended in chlorosis. **Milk Somatose** has also been introduced.

Not Official.

SOZOIODOL.

DI-IODOPARAPHENOLSULPHONIC ACID.

A white, shining, crystalline powder, containing Iodine about 52 p.c., Carbolic Acid 20 p.c., and Sulphur 7 p.c., preferably used in the form of its salts. When required in solution, the **Sodium** salt is most applicable, dissolving 1 in 14 of Water or Glycerin. The **Potassium** salt, soluble 1 in 100 of Water, is preferable as a **dusting powder,** or in **ointments.** Solution of **Zinc** salt, 1 to 3 p.c., is suitable for **injection.**

Medicinal Properties.—A substitute for Iodoform.

It is recommended locally in nasal and pharyngeal disorders, and as an application of great energy in parasitic skin affections.—*B.M.J.* '89, ii. 42; *T.G.* '89, 132; '91, 592. In aural and nasal affections.—*L.* '94 i. 1636; *B.M.J.E.* '94, i. 99.

Sozoiodol cotton and **gauze** containing 5 and 10 p.c.

HYDRARGYRI SOZOIODOLAS (Mercury Sozoiodol).—A fine, orange-yellow, amorphous powder, almost insoluble in Water, insoluble in Alcohol (90 p.c.).

It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from contact with the air and light.

Has been employed in syphilis and in psoriasis, chiefly by hypodermic injection (*see* below).

The injections of this salt are stated to be less painful than those of Mercuric Chloride.—*L.* '01, ii. 522; '03, i. 785; *B.M.J.* '03, i. 656.

Tests.—Mercury Sozoiodolate, although almost insoluble in Water, dissolves in Sodium Chloride Solution. 0·5 of a gramme with 1·5 grammes of Sodium Chloride should dissolve leaving only a faint turbidity. It contains theoretically 32·0 p.c. of metallic Mercury, which may be determined by distillation with Lime. A solution of 0·1 of a gramme in 1 c.c. of Nitric Acid and 9 c.c. of Water should be rendered only faintly turbid on the addition of Silver Nitrate solution, indicating the absence of Chlorides. A solution 0·2 of a gramme of the preparation dissolved in 20 c.c. of Water by the aid of a little Hydrochloric Acid should neither yield a distinct turbidity on the addition of Barium Nitrate Solution, nor on the addition of diluted Sulphuric Acid, indicating the absence of Sulphates and Barium salts. When ignited with free access of air it should leave no weighable residue.

INJECTIO HYDRARGYRI SOZOIODOLATIS HYPODERMICA.—Mercury Sozoiodol, 5 grains; Sodium Iodide, 10 grains; Distilled Water, 200 minims. Inject 10 to 15 minims = 0·6 to 0·88 c.c.—*Lock.*

Not Official.

SPERMIN.

DR. BROWN-SEQUARD'S ORCHITIC FLUID.

Full details regarding its preparation and uses are published *B.M.J.* '93, i. 1145, 1212, with an editorial article p. 1279; *B.M.J.E.* '94, ii. 52, 56; *T.G.* '93, 110.

In the form of an essence, 20 drops taken 3 times a day, in the treatment of abnormalities of frequency and rhythm of the pulse.—*B.M.J.E.* '02, i. 23; *L.* '02, i. 326.

SPIRITUS.

SPIRIT.

All saccharine substances which have undergone the vinous fermentation contain Alcohol, which can be separated by distillation. The various kinds of alcoholic liquids are distinguished by differences in flavour and colour.

When Alcohol is distilled with aromatic substances containing volatile Oil, part of the Oil is carried over by the alcoholic vapour, and condenses along with it.

All the official Spirits, except Brandy, are prepared with Alcohol (90 p.c.).

SPIRITUS ÆTHERIS NITROSI.

SPIRIT OF NITROUS ETHER.

B.P. Syn.—SWEET SPIRIT OF NITRE.

A transparent pale yellow, or greenish-yellow, mobile, volatile and inflammable liquid.

The *B.P.* describes Spirit of Nitrous Ether as an alcoholic solution containing Ethyl Nitrite, Aldehyde, and other substances; the *U.S.P.* describes it as an alcoholic solution of Ethyl Nitrite ($C_2H_5NO_2$), yielding when freshly prepared not less than 4 p.c. of Ethyl Nitrite; the *P.G.* gives no description.

It should be kept in well-stoppered glass bottles of a dark amber tint in a cool atmosphere, and should be exposed as seldom as possible to contact with the air and light.

Medicinal Properties.—Stimulant, diaphoretic, diuretic, and antipyretic. Useful in dropsy of renal origin, but is contra-indicated in acute nephritis. Being a nitrite, it is sometimes used in asthma, angina pectoris, and dysmenorrhœa. *See* also Medicinal Properties of Liquor Ammonii Acetatis.

Dose.—20 to 40 minims = 1·2 to 2·4 c.c., for repeated administration; for a single administration, 60 to 90 minims = 3·6 to 5·4 c.c.

Incompatibles.—Potassium Iodide, Ferrous Sulphate, Tincture of Guaiacum, Gallic and Tannic Acids, Antipyrine and Salicylates.

Prescribing Notes.—*When prescribed with Potassium Iodide, separation of Iodine may be prevented by previously neutralising the free acid in Spiritus Ætheris Nitrosi with Potassium or Sodium Bicarbonate, or the Carbonates. The* *incompatibility of Antipyrine and Spiritus Ætheris Nitrosi may be overcome by prescribing them in alkaline solution.*

The measure of gas evolved on the addition of Potassium Iodide solution is a measure of the acidity of the Spiritus Ætheris Nitrosi under examination. It should not amount to much more than a third of the total gas volume registered.

Foreign Pharmacopœias.—Official in Belg. (Æther Nitricus Alcoholicus), sp. gr. 0·84 to 0·86; Dutch (Nitris Æthylicus cum Spiritu), sp. gr. 0·84 to 0·85; Spiritus Ætheris Nitrosi.—Ger., sp. gr. 0·84 to 0·85; Jap., sp. gr. 0·84 to 0·85; Russ., sp. gr. 0·84 to 0·85; Swiss, sp. gr. 0·845 to 0·855; U.S., sp. gr. about 0·823 at 25° C. (77° F.). Ital. (Etere Nitroso Officinale), sp. gr. 0·85; Mex. (Eter Nitroso Alcoholizado); Norw. (Æther Nitrosus Spirituosus), sp. gr. 0·84 to 0·85; Port. (Acido Azotico Alcoolisado); Span. (Espiritu de Nitro Dulce).

Under the name of **'Itrosyl'** a concentrated form of Nitrous Ether has been introduced, 1 fl. oz. of which mixed with 19 fl. oz. of Alcohol (90 p.c.) is stated to be equivalent to Spiritus Ætheris Nitrosi.

Tests.—Spirit of Nitrous Ether has a sp. gr. of about 0·840. The *B.P.* says 0·823 to 0·842; the *U.S.P.* about 0·823 at 25° C. (77° F.); the *P.G.* 0·840 to 0·850. When freshly prepared it is neutral in reaction towards Litmus paper, but on keeping it gradually develops acidity, and then has an acid reaction towards blue Litmus paper. When carefully poured upon Ferrous Sulphate Solution acidified with Sulphuric Acid a dark brown or blackish-brown coloration is developed at the junction of the two fluids. The *U.S.P.* states that, if a test-tube be half filled with the spirit and put into a water-bath heated to 65° C. (149° F.) until it has acquired this temperature, the spirit should boil distinctly upon the addition of a few small pieces of broken glass. It is officially required to contain, when freshly prepared, 2½ p.c. w/w of Ethyl Nitrite, and even when it has been kept for some time, and the vessel which contains it has been occasionally opened, it should yield 2 p.c. w/w of Ethyl Nitrite, or a minimum of 1¾ p.c. as gasometrically determined by measuring the volume of Nitric Oxide gas evolved on treating it with Potassium Iodide Solution and Diluted Sulphuric Acid, as described below under the heading of Gasometric Determination. The *U.S.P.* requires that it shall contain not less than 4 p.c. of Ethyl Nitrite as gasometrically determined by the process given in small type under the heading of Gasometric Determination. The *P.G.* does not include a method of assay. Allen's method consists in treating the sample with an acidulated solution of Potassium Iodide and measuring the Nitric Oxide liberated. A nitrometer is filled with strong brine, 5 c.c. of Spirit of Nitrous Ether is introduced, followed by 5 c.c. of a strong Potassium Iodide solution, and then by 5 c.c. of diluted Sulphuric Acid. The nitrometer is agitated briskly at intervals, after 5 minutes the liquid is adjusted to the same level, the volume of gas is read off. To calculate the percentage of real Ethyl Nitrite the following data is required:—

1. The sp. gr. of the sample to be examined.
2. 23·55 c.c. of Nitric Oxide, measured at ordinary pressure and temperature, weigh 0·03 gramme.
3. 30 parts by weight of Nitric Oxide are equivalent to 75 parts by weight of Ethyl Nitrite.

The measure of gas evolved on the addition of Potassium Iodide is a measure of the acidity of the Spiritus Ætheris Nitrosi under examination. It should not amount to much more than a third of the total gas volume registered. The following process was suggested (*A.J.P.* '98, 273) for the assay of this preparation. Into a 100 c.c. flask provided with a loosely-fitting stopper place successively 10 c.c. of Distilled Water, 5 c.c. of a cold saturated aqueous Potassium Chlorate Solution, 5 c.c. of the sample to be tested, and 5 c.c. of a 10 p.c. Nitric Acid Solution. Insert the stopper and shake frequently for 30 minutes, then add 10 c.c. of Tenth-normal Volumetric Silver Nitrate Solution and shake briskly for 1 minute, add 10 drops of Ferric Ammonium Sulphate Solution, and titrate the excess of Tenth-normal Volumetric Silver Nitrate Solution with Tenth-normal Volumetric Potassium Sulphocyanate Solution. Each c.c. of Tenth-normal Volumetric Silver Nitrate Solution consumed corresponds to 0·0225 gramme of Ethyl Nitrite. This process was claimed to give higher and more correct results than Allen's nitrometer process, but the nitrometer process was never put forward as an absolutely true one, but as one by which Ethyl and other Nitrites might be estimated with approximate accuracy, and it has fulfilled its expectations admirably.

The more generally occurring impurities are free acid and Aldehyde. The *B.P.* requires that, when shaken with Sodium Carbonate, no effervescence, or only a very feeble effervescence, should occur. The *U.S.P.* requires that it should not effervesce when a crystal of Potassium Bicarbonate is dropped into it. The *P.G.* fixes a limit of acidity, requiring that 10 c.c. shall not possess an acid reaction after the addition of 0·2 c.c. of Normal Potassium Hydroxide, but does not state to what indicator of neutrality; presumably towards Litmus. As regards tests for Aldehyde, the *B.P.* requires that, when a measured quantity of 10 c.c. of the spirit is mixed with 5 c.c. of Volumetric Sodium Hydroxide Solution and 5 c.c. of Water, it should assume a yellow colour, which should not become brown on standing 12 hours. The *U.S.P.* includes a somewhat similar test though less stringent, requiring that the mixture should not turn a decided brown within 12 hours; the *P.G.* does not include a test for Aldehyde.

Gasometric Determination.—If 1 volume of the spirit is agitated briskly at intervals during 5 minutes in a nitrometer filled with saturated brine solution, with 1 volume of Potassium Iodide Solution and 1 volume of Diluted Sulphuric Acid, it should, when recently made, yield at the normal temperature [15·5° C. (60° F.)], and pressure (30 in. or 760 mm. of Mercury), at least 6½, but not more than 7, volumes of Nitric Oxide gas, *B.P.*

A quantity of about 30 grammes of the spirit (which has been previously shaken with 0·5 gramme Potassium Bicarbonate, is transferred to a graduated measuring flask of 100 c.c. capacity and its weight accurately determined. It is then diluted with sufficient Alcohol (94·9 p.c.) to produce 100 c.c. and thoroughly mixed. A measured quantity of 10 c.c. of this alcoholic solution is introduced into a nitrometer filled with a saturated brine. 10 c.c. of Potassium Iodide Solution is then introduced, and this in turn followed by 10 c.c. of Normal Volumetric Sulphuric Acid. The volume of gas evolved is read off when the volume of gas has become constant, usually within 30 to 60 minutes. The number of c.c. of gas is multiplied by 0·307, and the product divided by one-tenth the original weight of the Spirit of Nitrous Ether taken. At the standard temperature and pressure the quotient will represent the percentage of Ethyl Nitrite in the liquid.

The temperature correction is $\frac{1}{4}$ of 1 p.c. of the total percentage found, for each one degree, additive if the temperature is below, subtractive if above 25° C. (77° F.). The barometric correction is $\frac{4}{30}$ of 1 p.c. for each mm., additive if above, subtractive if below 760, *U.S.P.*

LIQUOR ETHYL NITRITIS. SOLUTION OF ETHYL NITRITE.

A transparent, colourless, or pale yellow, mobile, volatile, inflammable liquid. It consists of a mixture of 95 parts by volume of Absolute Alcohol with 5 parts by volume of Glycerin, and contains, when freshly made, 3 p.c. by weight, and even after keeping for some time not less than 2½ p.c. by weight of Ethyl Nitrite.

It should be kept in well-stoppered small glass bottles of a dark amber tint in a cool atmosphere and protected as far as possible from exposure to air and light.

The reasons for its introduction will be found, *P.J.* (3) xviii. 861.

Medicinal Properties.—Similar to those of the other more slowly acting Nitrites.

Dose.—20 to 60 minims = 1·2 to 3·6 c.c.

Experiments testing the physiological activity of the *B.P.* preparation compared with a 2·5 p.c. solution of the pure Ethyl Nitrite showed that both were practically identical.

Tests.—Solution of Ethyl Nitrite has a sp. gr. of about 0·825, the *B.P.* states 0·823 to 0·826. It is not official in either the *U.S.P.* or the *P.G.* When carefully poured on to the surface of a cold Solution of Ferrous Sulphate acidified with Sulphuric Acid, a dark brown or blackish-brown ring is developed at the junction of the two liquids. It is officially required to yield, when freshly prepared, at least 7·6 volumes of Nitric Oxide gas, and a solution which has been kept some time, and the vessel containing it having been occasionally opened, is required to possess at least five-sixths of the strength indicated, as gasometrically determined by shaking for 5 minutes in a brine-charged nitrometer, 1 volume of the solution with 1 volume of Potassium Iodide Solution and 1 volume of Diluted Sulphuric Acid.

The more generally occurring impurities are free acid and Aldehyde. The solution should not effervesce when shaken carefully with Sodium Bicarbonate, indicating the absence of free acid. A measured quantity of 10 c.c., when mixed with an equal volume of a mixture of equal parts of Volumetric Sodium Hydroxide Solution and Water, should not assume a yellow colour, indicating the absence of Aldehydes.

Not Official.

SPIRITUS FRUMENTI.

WHISKY.

The term Whisky is here intended to apply to an alcoholic liquid obtained from fermented Grain by distillation and the product of the Pot Still. Whisky is described in the *U.S.P.* as an alcoholic liquid obtained by the distillation of the fermented mash of Grain, such as Indian Corn, Rye, Wheat and Barley, or other mixtures, but no mention is made as to whether it should be the product of the Pot or Patent Still; it is, however, required to be at least 4 years old. Allen states in the majority of cases a judicious admixture of raw and malted Grain is employed; other things being equal, the spirit from malted Grain is the most valuable and contains least Fusel Oil. It has recently been held as the result of a magisterial decision that only Pot Still Whisky distilled in Ireland and Scotland could be legally sold as Whisky, thus eliminating Patent Still Whisky. An appeal lodged against this decision resulted in an equal division of opinion on the subject, and the case was referred for re-hearing. The Royal Commission appointed to investigate not only the point whether Pot or Patent Still Whisky should be the legal representative of the article, but also the whole position with regard to the subject, in an interim report arrives at the following conclusions:—(1) That no restrictions should be placed upon the processes of, or apparatus used for the distillation of any Spirit to which the term Whisky may be applied as a trade description. (2) That the term Whisky having been recognised in the past as applicable to a potable Spirit manufactured from (i) Malt, or (ii) Malt and other malted Barley, or other cereals, the application of the term Whisky should not be denied to the product manufactured from such materials. Whisky improves greatly on keeping; when new it is colourless or nearly so, but by storing in Sherry casks (a favourite method of imparting flavour to Whisky) it acquires colour, and then contains sensible traces of Tannin, Sugar, etc. The smoky flavour of Irish Whisky is due to the fact that the Malt used has been dried upon kilns in which Peat is used for fuel, but is sometimes imitated by adding 1 or 2 drops of Creosote to the gallon of spirit. It is doubtful whether Fusel Oil is ever purposely added to Whisky, but it is almost invariably present in greater or less quantity, and has been stated to be the cause of objectionable symptoms produced by new spirit. Allen is of opinion that as the Amyl Alcohol in spirits rarely exceeds 0·1 p.c. or 70 grains per proof gallon, it seems highly improbable that it could produce the local effects sometimes attributed to it; its effect on the general system has probably been greatly exaggerated. It is a noticeable fact (*B.M.J.* '03, ii. 1645) that whereas years ago 70 p.c. of the Whisky was Malt Whisky and 30 p.c. Grain or Patent Spirit, the proportions are now reversed.

Tests.—Whisky has a sp. gr. of about 0·930. The *U.S.P.* states it should not be more than 0·945 nor less than 0·924 at 15·6° C. (60° F.).

Absolute Alcohol.—It contains from 50 to 64 p.c. w/v of Absolute Alcohol. The *U.S.P.* says from 44 to 55 p.c. w/v corresponding to 37 to 47·5 p.c. by weight of Absolute Alcohol. The Alcohol may be determined by distilling a known volume of the Whisky and ascertaining the sp. gr. of the distillate when made up to a definite volume. The percentage of Absolute Alcohol by weight, corresponding to this gravity, may be found by reference to an Alcohol table. In calculating the result on the original Whisky it is necessary to take into consideration the sp. gr. of the sample and the volume used for the distillation.

Extractive Matter.—The amount of extractive matter rarely amounts to more than 100 grains per gallon, equivalent to about 0·15 p.c. The *U.S.P.* states that the limit of residue when dried at 100° C. (212° F.) is 0·5 p.c. w/v, and this residue is required to possess no sweet or distinctly spicy taste. The amount may be determined by evaporating a definite volume (25 c.c.) to dryness on a water-bath, drying the residue at a temperature of 100° C. (212° F.) till constant in weight, and when cool, weighing.

Total Acid.—The total acid may vary from 0·01 p.c. to 0·083 p.c., and may be determined by titrating a measured quantity of 25 c.c. of the sample with Tenth-normal Barium or Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. The *U.S.P.* requires that to render 100 c.c. of Whisky distinctly alkaline to Litmus not more than 1·2 c.c. of Normal Volumetric Potassium Hydroxide Solution should be necessary.

Volatile Acid.—The volatile acid may vary from 0·014 p.c. to 0·072 p.c. w/v. It may be determined by distilling a measured quantity (100 c.c.) almost to dryness, adding 25 c.c. of Water to the residue in the distillation flask and continuing the distillation until reduced to a low bulk. The distillate is titrated with Tenth-normal Volumetric Barium or Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. 1 c.c. of Tenth-normal

Volumetric Barium or Sodium Hydroxide Solution is equivalent to 0·005958 gramme of Acetic Acid. The difference between the number of c.c. of Tenth-normal Volumetric Barium or Sodium Hydroxide Solution required to neutralise the volatile acid, and the calculated number of c.c. of Tenth-normal Volumetric Barium or Sodium Hydroxide Solution required to neutralise 100 c.c. of the original sample represents that necessary for the neutralisation of the fixed acid, and may be calculated into Tartaric Acid. Each c.c. of Tenth-normal Volumetric Barium or Sodium Hydroxide Solution represents 0·007446 gramme of Tartaric Acid.

Esters.—The proportion of esters in Whisky varies from 0·033 p.c. w/v to 0·185 p.c. w/v. They may be determined by distilling a measured quantity of 100 c.c. of the sample in a distillation flask almost to dryness, adding 25 c.c. of Water and again distilling to a volume of about 5 c.c. The free acid in the distillate is neutralised with Tenth-normal Volumetric Barium or Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. A measured quantity of 25 c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution is then added and the contents of the flask boiled under a reflux condenser for 1 hour, cooled, and the excess of Tenth-normal Volumetric Alkali Solution titrated with Tenth-normal Volumetric Sulphuric Acid Solution, still employing Phenolphthalein Solution as an indicator of neutrality. In the event of the specimen containing more Ethers than correspond with this quantity of Sodium Hydroxide Solution, which is at once indicated by the disappearance of the pink colour, a further quantity of the Tenth-normal Volumetric Alkali Solution should be added. The number of c.c. of Tenth-normal Volumetric Sulphuric Acid Solution used is subtracted from the number of c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution added, the difference is calculated into terms of Ethyl Acetate. 1 c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution corresponds to 0·0088 gramme of Ethyl Acetate.

Higher Alcohols.—The higher Alcohols in Whisky vary from 0·082 p.c. w/v to 0·260 p.c. w/v. Various methods have been suggested for the determination of these higher Alcohols, the most reliable and the one now most generally used is the Marquardt process as modified by Allen and Chattaway, and generally referred to as the Allen-Marquardt process. It consists in distilling a measured quantity of 200 c.c. of the specimen to be examined until reduced in volume to 20 c.c. To the residue in the distillation flask are added 50 c.c. of Water and 10 grammes of Sodium Sulphate, and the distillation continued until reduced to 10 c.c.; the mixed distillates are titrated with Tenth-normal Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. A further measured quantity of 20 c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution is added and the liquid boiled for 1 hour under a reflux condenser, the excess of Tenth-normal Volumetric Sodium Hydroxide Solution is titrated with Tenth-normal Volumetric Hydrochloric Acid Solution. The liquid is now divided into two equal parts, each corresponding to 100 c.c. of the original specimen, and each of which is treated in the following way in order to yield a duplicate determination: A saturated solution of common salt (prepared by saturating Water with clean table salt and adding dilute Sulphuric Acid until the liquid has a distinct acid reaction, and filtering) is added to the liquid until the resulting mixture has a sp. gr. of 1·1 when it is extracted in a separator four times with Carbon Tetrachloride, using 40 c.c. of the Carbon Tetrachloride for the first extraction, 30 c.c. for the second, 20 c.c. for the third, and 10 c.c. for the last extraction. The Carbon Tetrachloride now contains the whole of higher Alcohols and some Ethyl Alcohol. To remove the latter the Carbon Tetrachloride is shaken with 50 c.c. of brine, and after this has been separated it is shaken with 50 c.c. of a saturated Solution of Sodium Sulphate to remove the Chloride. The Carbon Tetrachloride is next treated with an oxidising mixture consisting of 5 grammes of Potassium Bichromate, 2 grammes of strong Sulphuric Acid and 10 c.c. of Water; the oxidation may be carried out in a flask connected with a reflux condenser, or preferably in well-made glass bottles possessing accurately fitting ground glass stoppers: the stoppers being securely tied down and the bottles heated in a water-oven. When the oxidation is performed under a reflux condenser, at least 8 hours boiling is necessary, but when conducted under pressure in stoppered bottles, if shaken frequently, from 3 to 4 hours only is necessary for complete oxidation. The liquid is transferred to a distilling flask, the bottle rinsed with 30 c.c. of Water, the washings transferred to the distilling flask and the liquid distilled until only 20 c.c. remain in the flask. A measured quantity of 80 c.c. of Water is added to the residue and the distillation continued until only 5 c.c. remain. The mixed distillates are now titrated with Tenth-normal Volumetric Barium Hydroxide Solution using Methyl Orange Solution as an indicator of neutrality, shaking the liquid thoroughly after each addition. The amount of alkali required to neutralise the liquid at this stage should not exceed 2 c.c., and generally less is required; a few drops of Phenolphthalein Solution are now added and the titration continued. Each c.c. of Volumetric Barium Hydroxide Solution required in the second stage of the titration corresponds to 0·0088 gramme of higher Alcohols expressed in terms of Amyl Alcohol. The alkali which was added when titrating with Methyl Orange Solution is stated to represent the mineral acid which is distilled. This method has been carefully investigated by Schidrowitz and Kaye (*J.S.C.I.* '02, 815; *Analyst* xxx. 190), who state that 'of the methods examined, that of Allen-Marquardt, with certain minor modifications, is alone capable of giving fairly reliable figures, at any rate where Whisky is concerned, and that we are still inclined to believe that if carefully worked this process is still the most reliable of all those published.' The process has also been criticised (*J.S.C.I.* '06, 1125), in the course of an extended investigation of samples of Whisky for the Western Australian Government it was found that operating upon pure materials no mineral acid was produced as the result of the oxidising mixture alone or from its action upon Carbon Tetrachloride. It was, however, noticed that Valerianic Acid in a similar manner to Acetic Acid had a distinct action upon Methyl Orange Solution, and it is concluded that the titration for mineral acids is unnecessary and introduces errors, and that accurate results may be obtained by observing the following points: (*a*) The shaking out should be performed at a temperature of 15·5° C. (60° F.) or less; (*b*) the oxidation to be conducted in pressure bottles; (*c*) the higher Alcohols should be determined by direct titration only, calculating all acidity as Valerianic Acid.

Aldehyde.—Aldehyde may be detected in the distilled spirit, or if present in very minute proportions in the first fraction of the distillate. 10 c.c. of the distilled spirit may be mixed with 4 c.c. of Schiff's reagent, prepared by mixing 30 c.c. of a 1 in 1000 aqueous solution of Magenta with 20 c.c. of Sodium Bisulphite Solution (sp. gr. 1·31), 3 c.c. of Sulphuric Acid and 200 c.c. of Water.

Furfural.—Furfural may be detected by means of Aniline Acetate, 10 c.c. of the distilled spirit is mixed with 2 c.c. of an Aniline Acetate Solution prepared by dissolving 10 drops of Aniline in 2 c.c. Glacial Acetic Acid.

As a test for the absence of more than a trace of Fusel Oil from grain, the *U.S.P.* requires that if 100 c.c. of Whisky be very slowly evaporated on a dish or water-bath, the last portions volatilised should not have a harsh or disagreeable odour. The absence of added Sugar, Glycerin and aromatic substances, is judged by the character of the residue left on drying as described above. The absence of more than traces of Oak Tannin from casks is assured by the residue being required to dissolve completely in 10 c.c. of cold Water to form a solution which should not be coloured deeper than light green on the addition of a few drops of Ferric Chloride T.S. The *U.S.P.* also requires that if 50 c.c. of Whisky be shaken vigorously in a stoppered flask with 20 c.c. of Kaolin, and filtered, after standing half an hour the filtrate should not be lighter in colour than the Whisky before treatment.

Official in U.S.

Not Official.

SPIRITUS METHYLATUS.

METHYLATED SPIRIT.

The duty-free spirit supplied to 'manufacturers' under a special bond, is a mixture of 9 parts of Alcohol with 1 part of a Wood Naphtha, approved by the Excise. It can also be supplied under a special bond for scientific purposes.

As supplied to 'licensed retailers,' Methylated Spirit is 3 pints of Petroleum Oil added to 100 gallons of the mixture described above. The Petroleum Oil is added, partly to make it more nauseous for drinking, and partly to facilitate its recognition. It becomes turbid when mixed with Water, which quality renders it unsuitable for many purposes to which duty-free spirit has been applied.

Licensed retailers of Methylated Spirit must not sell more than 1 gallon at any one time, and may not keep stock exceeding 50 gallons. They may not sell Methylated Spirit between the hours of 10 p.m. on Saturdays and 8 a.m. on Mondays.

SPIRITUS RECTIFICATUS.

ALCOHOL (90 p.c.).

B.P.Syn.—Rectified Spirit.

A transparent, colourless, mobile, volatile and inflammable liquid, having a distinctive spirituous odour and burning taste.

The Alcohol (90 p.c.) of the *B.P.* is described as a liquid containing 90 parts by volume, equivalent to 85·65 p.c. by weight, of Ethyl Hydroxide, C_2H_5OH, eq. 45·7, and 10 parts by volume, equivalent to 14·35 p.c. by weight, of Water, and its official method of preparation is by the distillation of fermented Saccharine liquids. It is only slightly stronger than the Rectified Spirit of the *B.P.* '85, containing, by volume, 1·35 p.c., or by weight 1·65 p.c. more Ethyl Hydroxide. The equivalent to this spirit in the *U.S.P.* is known under the title Alcohol, and it is described as a liquid composed of about 92·3 p.c. by weight, or about 94·9 p.c. w/v of absolute Ethyl Alcohol, and about 7·7 p.c. w/w of Water. The *P.G.* describes it under the heading of Spiritus, and states that 100 parts contain 91·2 to 90 parts by volume, equivalent to 87·2 to 85·6 p.c. by weight.

It should be kept in well-closed vessels and in a cool atmosphere, and it should be kept away from lights or fire.

On mixing Alcohol (90 p.c.) and Water, contraction of volume and rise of temperature occur. When such a mixture is prescribed in the British Pharmacopœia, the cooled liquid should be employed.

It is possible to rectify Alcohol up to 98 p.c., and 95 p.c. is prepared commercially in large quantities.

It may here be noted that although it is illegal for chemists and druggists to sell Rectified Alcohol except upon prescription, the Board of Inland Revenue does not appear to interfere with its sale by them in small quantities not exceeding 8 oz. at a time, for the purposes of medical or scientific research.

Alcohol (90 p.c.) dissolves Camphor, Balsams, Castor Oil, Iodine, Potassium and Sodium Hydroxides, but not the Carbonates.

Medicinal Properties.—Internally a powerful diffusible stimulant, especially cardiac; antipyretic, diuretic, and diaphoretic. Used in some states of acute disease characterised by excessive debility, as in typhoid, acute pneumonia, and influenza, to maintain the strength over the crisis; in chronic wasting diseases as phthisis; in insomnia of old people; during a meal in small quantity, as an aid to digestion and absorption, and to promote appetite, more especially in the aged and feeble and in those exhausted by overwork; in sudden fainting. In acute dyspepsia it is injurious; it may, however, check vomiting, and brandy often checks diarrhœa. In moderation it acts as a food, and saves tissue waste. Large quantities paralyse the gastric secretion, produce gastritis, and ultimately atrophy of the gastric glands. Externally to prevent bed sores and cracked nipples by hardening and disinfecting the skin; it is antiseptic and astringent, and is applied diluted to stop sweating and to produce cold by evaporation; 1 of Alcohol (90 p.c.) and 2 of Camphor Water mixed is a good evaporating **lotion.** Diluted it forms a lotion for erysipelas, erythema, burns, and scalds while the cuticle is entire, and for sprains and recent bruises. As an ingredient of liniments it is rubefacient, it relieves rheumatic and other kinds of pain, and aids the resorption of inflammatory products.

Foreign Pharmacopœias.—Official in all; Fr., Alcool Éthylique à 95 degrés centésimaux.

Tests.—Alcohol (90 p.c.) has a sp. gr. of 0·834. The sp. gr. of the Alcohol official in the *U.S.P.* is about 0·816 at 15·6° C. (60° F.) or 0·809 at 25° C. (77° F.); that official in the *P.G.* 0·830 to 0·834. It readily volatilises, and when ignited burns with a pale blue non-luminous flame. If to a few c.c. of Alcohol 1 or 2 drops of a Potassium Hydroxide Solution (50 p.c.) be added, and then a solution of Iodine drop by drop till the liquid contains a slight but distinct excess of Iodine, and the mixture be warmed to about 60° C. (140° F.), it yields a powerful penetrating odour of Iodoform. When mixed with a small quantity of Solution of Potassium Permanganate and Diluted Sulphuric Acid it is rapidly oxidised, the distinctive odour of Acetaldehyde being evolved. It reduces Potassium Bichromate Solution, yielding similarly an odour of Acetaldehyde, the solution changing to a bright green. It should be miscible in all proportions with Water, the solution should be odourless and free from turbidity.

The more generally occurring impurities are fixed residue, oily or resinous substances, Fusel Oil and allied impurities, Amylic Alcohol and other organic impurities, Aldehyde, Tannic Acid from Oak cask, excess of Aldehyde. It leaves no weighable residue upon evaporation, indicating the absence of fixed residue. It should afford a clear liquid when mixed with Water, indicating the absence of oily or resinous substances. A small quantity of the Alcohol allowed to evaporate on a piece of clean white bibulous paper should leave no unpleasant odour after the Alcohol has completely evaporated, indicating the absence of Fusel Oil and allied impurities. The *U.S.P.* mixes the Alcohol with half its volume of Water and one-tenth of its volume of Glycerin and allows the mixture to evaporate spontaneously. The *P.G.* does not include an evaporation test. The remarks upon the *B.P.* and the *U.S.P.* methods of testing for Fusel Oil and allied impurities are described under Alcohol Absolutus. The *P.G.* requires that, when a mixture of 10 c.c. of spirit and 0·2 c.c. of Potassium Hydroxide Solution (15 p.c.) is evaporated to one-tenth its volume the residue, when supersaturated with Sulphuric Acid, should develop no odour of Fusel Oil. As an additional test for the presence of Amylic Alcohol and readily charred organic impurities, the *U.S.P.* evaporates 25 c.c. spontaneously in a porcelain evaporating dish, carefully protecting the liquid from dust during the evaporation. The evaporation is continued until the surface of the dish is barely moist, on then adding a few drops of colourless concentrated Sulphuric Acid the residue should not produce a red or brown coloration. The *P.G.* performs the test for readily carbonisable organic impurities on the spirit direct without evaporation. In testing for Aldehyde the *B.P.* and *U.S.P.* give practically the same test. The Ammonia test for Tannic Acid and excess of Aldehyde is common to the *B.P.* and the *P.G.*, but is omitted from the *U.S.P.* The *P.G.* includes, in addition, a test with Hydrogen Sulphide which is described below. The *U.S.P.* includes a test for the absence of more than 2 p.c. of Methyl Alcohol. The explanation of this test, given under Alcohol Absolutum and a description of the test itself, is in small type below; it is not given in either the *B.P.* or the *P.G.*

Potassium Hydroxide.—On mixing 10 c.c. of the spirit with 5 c.c. of Potassium Hydroxide T.S. the liquid should not immediately darken in colour, *B.P.*; should not at once assume a yellow colour, *U.S.P.*

Ammonia.—No immediate darkening in colour should occur on the addition of Ammonia T.S. to Alcohol (90 p.c.), *B.P.*; the spirit should not become coloured, *P.G.*

Hydrogen Sulphide.—Spirit should not become coloured by T.S. of Hydrogen Sulphide, *P.G.*

Silver Nitrate.—After exposing 100 c.c. of Alcohol (90 p.c.) with 2 c.c. of Volumetric Silver Nitrate Solution to bright light for 24 hours and decanting the liquid from the black powder formed, no further change should occur when the liquid is again exposed with more of the Volumetric Silver Nitrate Solution, *B.P.*; 10 c.c. of spirit should neither become turbid nor coloured on warming with 5 drops of T.S. of Silver Nitrate, *P.G.*; if 20 c.c. of Alcohol be shaken in a clean, glass-stoppered vial with 1 c.c. of Silver Nitrate T.S., the mixture should not become more than faintly opalescent or acquire more than a faint brownish tint when exposed for 6 hours to diffused daylight, *U.S.P.*

Sulphuric Acid.—A mixture of 10 c.c. of spirit and 0·2 c.c. of Potassium Hydroxide, evaporated to 1 c.c. and supersaturated with diluted Sulphuric Acid, should not have any odour of Fusel Oil, *P.G.* If 5 c.c. of spirit be carefully poured as a layer over 5 c.c. of Sulphuric Acid, no rose-red zone should form at the line of contact, even after standing for some time, *P.G.* If 25 c.c. of Alcohol be allowed to evaporate spontaneously in a porcelain evaporating dish, carefully protected from dust, until the surface of the dish is barely moist, no red or brown colour should be produced upon the addition of a few drops of colourless, concentrated Sulphuric Acid (absence of Amyl Alcohol, or non-volatile, carbonisable, organic impurities), *U.S.P.*

Potassium Permanganate.—The red colour of a mixture of 10 c.c. of spirit and 1 c.c. of Potassium Permanganate T.S. should not become yellow within 20 minutes, *P.G.*

Copper Wire and Resorcin.—1 c.c. of the Alcohol or spirit is transferred to a test-tube of a capacity of about 40 c.c., and sufficient Water added to bring the volume of the liquid to 10 c.c., the test necessitating the proportion of Alcohol in the liquid not being more than about 10 p.c. by volume. 1 metre of No. 18 clean Copper Wire is wound closely round a glass rod 7 mm. thick so as to form a coil about 3 cm. long, the end of the wire being formed into a handle; the coil is heated to redness in a non-luminous flame and plunged, whilst red hot, to the bottom of the liquid in the test-tube and held there for a second or two, withdrawn, and dipped into Water to cool. This operation is repeated five or six times, immersing the test-tube in cold Water to keep it cool. The contents are now filtered into a wide test-tube and boiled very gently; if the odour of Acetaldehyde be perceptible the boiling is continued until the odour has ceased to be clearly distinct; the liquid is cooled, a drop of a 1 in 200 Resorcinol solution added. A portion of this liquid is poured carefully upon the surface of some pure concentrated Sulphuric Acid contained in another test-tube, the tube is allowed to stand for 3 minutes and then slowly rotated, a rose-red coloration should not develop at the point of contact of the two liquids (absence of more than 2 p.c. of Methyl Alcohol), *U.S.P.*

DILUTED ALCOHOL.

Four strengths of diluted Alcohol are official containing respectively, 70, 60, 45 and 20 p.c. of Ethyl Hydroxide by volume. They may be prepared as described in the following paragraphs.

1. Alcohol (70 p.c.).—124⅝ fl. oz. of Alcohol (90 p.c.) mixed with 38⅝ fl. oz. of Water, or 777·7 c.c. of Alcohol (90 p.c.) with 241·6 c.c. of Water; temperature 15·5° C. (60° F.). Sp. gr. 0·8900.

2. Alcohol (60 p.c.).—With 106¾ fl. oz. of Alcohol (90 p.c.) mix 57¼ fl. oz. of Water, or with 666·6 c.c. of Alcohol (90 p.c.) mix 357·8 c.c. of Water; temperature 15·5° C. (60° F.). Sp. gr. 0·9135.

3. Alcohol (45 p.c.).—With 80⅛ fl. oz. of Alcohol (90 p.c.) mix 84¼ fl. oz. of Water, or with 500 c.c. of Alcohol (90 p.c.) mix 526·6 c.c. of Water; temperature 15·5° C. (60° F.). Sp. gr. 0·9436.

4. Alcohol (20 p.c.).—With 35⅝ fl. oz. of Alcohol (90 p.c.) mix 126½ fl. oz. of Water, or with 222·2 c.c. of Alcohol (90 p.c.) mix 791 c.c. of Water; temperature 15·5° C. (60° F.). Sp. gr. 0·9760.

When the sp. gr. of Alcohol is 0·920 it is called **Proof Spirit**; if lighter than this, it is called 'above proof'; if heavier than this, 'under proof'; and the percentage of Water, or of Rectified Spirit, sp. gr. 0·825 (the Inland Revenue Standard), by measure, necessary to be added to any sample of Spirit to bring it to the standard of Proof Spirit, indicates the number of degrees the given sample is above or below proof. Thus, if 100 volumes of a Spirit require 10 volumes of Water to reduce it to proof, it is said to be '10 over proof'; on the other hand, if 100 volumes of Spirit require 10 volumes of Spirit to raise it to proof, the sample is said to be '10 under proof.'

U.S. defines three strengths of Alcohol: **Alcohol Absolutum,** containing 99 p.c. of Alcohol; **Alcohol,** about 94·9 p.c.; and **Alcohol Dilutum,** about 48·9 p.c. All by volume.

Ger. describes four strengths: **Alcohol Absolutus,** containing 99·4 to 99·7 p.c. of Alcohol; **Spiritus,** 90 to 91·2 p.c.; **Spiritus Dilutus,** 68 to 69 p.c.; **Spiritus e Vino,** 37 to 41 p.c. The three former by volume, the last by weight.

The Spirits of the Pharmacopœias are as follows:—

	Sp. gr.	Percentage of Absolute Alcohol by Volume.	
British	0·834	Alcohol 90 p.c. (Spiritus Rectificatus)	90
,,	0·890	,, 70 p.c.	70
,,	0·9135	,, 60 p.c.	60
,,	0·9436	,, 45 p.c.	45
,,	0·976	,, 20 p.c.	20
Austrian	0·830—0·834	Sp. Vini Concentratus	90 to 91·2
,,	0·892—0·896	,, Dilutus	68 to 69
,,	0·935—0·945	,, Cognac	44 to 48
Belgian	0·816—0·820	,, Spiritus	94·09
Danish	0·812—0·816	Spiritus Alcoholisatus	95 to 96
,,	0·831—0·834	,, Concentratus	90 to 91
,,	0·890—0·895	,, Dilutus	68 to 70
Dutch	0·8159	,, Fortior	95
,,	0·8897	,, Dilutus	70
French	0·79433—0·8095	Alcool Éthylique	100
,,	0·816	,, ,, at 95°	95

	Sp. Gr.	Percentage of Absolute Alcohol by Volume.	
German	0·796 0·800	Alcohol Absolutus	99·4 to 99·7
,,	0·830 0·834	Spiritus	90 to 91·2
,,	0·892 -0·896	,, Dilutus	68 to 69
,,	0·920 –0·924	,, e Vino (by weight)	37 to 41
Hungarian	0·831 –0·834	,,	90 to 91
,,	0·892	,, Dilutus	70
,,	0·919 –0·924	Cognac (by weight)	46 to 50
Italian	0·8346	Alcool 90°	90
,,	0·800	,, Assoluto	99
,,	0·9141	,, 60°	60
Japanese	0·830—0·834	Spiritus	90 to 91·2
,,	0·892—0·896	,, Dilutus	68 to 69
Mexican	0·79	Alcohol Vinico	100
,,		,, at 50°	50
,,		,, 60°	60
,,		,, 80°	80
,,		,, 90°	90
Norwegian	0·8306—0·8339	Spiritus Concentratus	90 to 91
,,	0·9021—0·9044	,, Dilutus	64 to 65
Portuguese	0·834	Alcool at 90°	90
,,	0·850	,, 85°	85
,,	0·905	,, 65°	65
Russian	0·813—0·816	Sp. Vini Alkoholisatus	95
,,	0·831—0·834	,, Rectificatissimus	90
,,	0·888—0·890	,, Rectificatus	70
,,	0·952—0·955	,, Dilutus	38
Spanish	0·794	Alcohol Anhidro	100
,,	0·8161	,, de 95°	95
,,		,, de 60°	60
Swedish	0·831 –0·833	Spiritus Concentratus	90 to 91
,,	0·903 –0·905	,, Dilutus	63 to 64
,,	0·935	,, Tenuis	48 to 50
Swiss	0·830 –0·834	,,	90·09 to 91·29
,,	0·892—0·895	,, Dilutus	68·12 to 69·34
,,	0·916—0·939	,, e Saccharo (Rum)	50 to 60
,,	0·927—0·950	,, e Vino (Cognac)	45 to 55
U.S.	0·816	Alcohol	94·9
,,	0·797	,, Absolutum (by weight)	99
,,	0·936	,, Dilutum	48·9
,,	0·925 –0·941	Sp. Vini Gallici	46 to 55
,,	0·924—0·945	,, Frumenti	44 to 55

Relative Strength of Wines and Spirits.—The following figures represent the average strength in Alcohol by Volume: Jamaica Rum, about 69 p.c.; Proof Spirit, about 57 p.c.; Whisky, about 51 p.c.; Brandy, about 48 p.c.; Gin, about 47 p.c.; Port, Sherry and Madeira, about 20 p.c.; Burgundy, Claret, Hock and Moselle, about 10 p.c.; strong Ale and Stout, 7 to 8 p.c.; Beer and Cyder, 5 to 6 p.c.

SPIRITUS VINI GALLICI.

BRANDY.

The *B.P.* describes Brandy as a spirituous liquid distilled from Wine and matured by age. It is required to contain not less than 36½ p.c. w/w or 43½ p.c. w/v of Ethyl Hydroxide. The *U.S.P.* describes it as an alcoholic liquid obtained by the distillation of the fermented unmodified juice of fresh grapes, requires it to be at least 4 years old, and that it shall contain approximately 39 to 47 p.c. w/w or 46 to

55 w/v of Absolute Alcohol. The *P.G.* does not include Brandy. A good deal of attention has been devoted to the subject of Brandy, and numerous prosecutions have arisen from the sale of a mixture of Brandy and a spirit not derived from the distillation of the grape as genuine Brandy. At a discussion opened before the Society of Public Analysts by Mr. Otto Hehner and reported in the *Analyst* xxx. 36, it seemed to be generally agreed that a definite standard of 80 per 100,000, that is to say, 80 grammes of Ethyl Acetate per 100,000 of Absolute Alcohol, could not be relied upon for the compound Ethers. Schidrowitz and Kaye have found (*Analyst*, xxx. 149) that the 'break down' of Brandy if effected with faintly alkaline Water is liable to seriously affect the Ether value, a sample possessing an Ester value of 98·8, that is to say, containing 98·8 grammes of Ethers expressed as Ethyl Acetate per 100 litres of Absolute Alcohol, when broken down the Ester value was reduced to 66·5. The former author considers (*J.S.C.I.*, '05, 177) that each case should be considered on its merits, and no conclusion should be drawn from a single figure, on the other hand the sample which is analytically satisfactory is not necessarily genuine. In cases of doubt a taster's assistance should be requisitioned, if both the opinion of the analyst and of an unprejudiced taster are adverse to the sample, the merchant or distiller should be called on to give evidence as to the origin, etc.

In the present state of our knowledge it is impossible to tell from an analytical point of view the origin of the spirit in Brandy.

Tests.—The *B.P.* does not include any test for Brandy, nor does it even indicate a method by which the official percentage of Ethyl Hydroxide may be ensured. The sp. gr. of Brandy is about 0·930. The *U.S.P.* requires that the sp. gr. of Brandy should be not more than 0·941 nor less than 0·925 at 15·6° C. (60° F.). Genuine typical Brandies contain from 39 to 47 p.c. by weight of Absolute Alcohol, and these limits have been adopted as a standard of strength by the *U.S.P.* The average strength of Absolute Alcohol is about 42 p.c. w/w. The percentage of Absolute Alcohol may be determined by a similar method to that described under Spiritus Frumenti. The extractive matter varies from 0·6 to 1·5 p.c. and averages about 0·75 p.c. w/v. The *U.S.P.* requires that the percentage w/v of residue dried at 100° C. (212° F.) should not amount to more than 0·5, and that this residue should have no sweet or distinctly spicy taste, indicating the absence of added Sugar, Glycerin and aromatic substances, and may be determined by evaporating a measured quantity of 25 c.c. to dryness on a water-bath, the residue being dried at a temperature of 100° C. (212° F.) until constant in weight, and when cool, weighed. The proportion of volatile acid varies from 0·032 p.c. w/v to 0·1 p.c. w/v, averaging about 0·042 p.c. w/v. It may be determined on the distilled spirit by a similar method to that described under Spiritus Frumenti, and may be expressed in terms of Acetic Acid. The compound Ethers expressed in terms of Ethyl Acetate vary from 0·051 to 0·086 p.c. w/v, and average about 0·055 p.c. w/v, equivalent to 130·9 per 100,000, calculated on a spirit of an average Alcohol content of 42 p.c.

Their amount may be determined by the Saponification test given under Spiritus Frumenti. The *U.S.P.* includes a limit of free acid which represents the total acidity of the Brandy, volatile acid as well as fixed, and mentions that 100 c.c. of the Brandy should require not more than 1 c.c. of Normal Volumetric Potassium Hydroxide Solution to render it distinctly alkaline to Litmus. The higher Alcohols expressed in terms of Amyl Alcohol vary from 0·05 p.c. w/v to 0·136 p.c. w/v, averaging about 0·068 p.c. w/v, their amount may be determined by the Allen-Marquardt process given under Spiritus Frumenti, and the same tests as are there described for the detection of Aldehyde and Furfural may also be employed here.

The Circular No. 18 issued by the United States Department of Agriculture defines potable Brandy as a distillate from Wine properly aged by storage in wood, to eliminate the amount of Fusel Oils, etc., which may be present. It is required to contain not less than 45 nor more than 55 p.c. w/v of Absolute Alcohol, and not more than 0·25 p.c. w/v of extractive matter. The contents of Fusel Oil should not exceed 0·25 p.c. w/v. Brandy should not be mixed with Alcohol from any other source than that of distilled Wine, the distillate from the lees, pomace, and refuse of the winery is not entitled to bear the term 'Brandy' in the potable sense. Cognac is only admitted as a name, in the case of Brandies made in Cognac from wines grown and manufactured there; no artificial colour other than that derived from the wood in which they are aged is admitted in Brandies. The *U.S.P.* requires that when 100 c.c. of Brandy are slowly evaporated in a tared dish on a water-bath the last portions volatilised should have an agreeable odour free from harshness, indicating the absence of Fusel Oil from grain or pot spirit, the residue should completely dissolve in 10 c.c. of cold Water, and the solution so produced should not be coloured deeper than light green on the addition of a few drops of Ferric Chloride T.S., indicating the absence of more than traces of Oak Tannin from casks.

Foreign Pharmacopœias.—Official in Austr. (Spiritus Vini Cognac), U.S. (Spiritus Vini Gallici).

Preparation.

MISTURA SPIRITUS VINI GALLICI. Mixture of Brandy.

Rub the yolks of two Eggs with ½ oz. of Refined Sugar; add 4 fl. oz. of Cinnamon Water and 4 fl. oz. Brandy.

Dose.—*As a draught*, 1 to 2 fl. oz. = 28·4 to 56·8 c.c.

Not Official.

STANNI OLEAS.

A greyish, coarsely granular powder, insoluble in Alcohol, very slightly soluble in Almond Oil, completely disintegrated and partially dissolved by Ether or Oleic Acid.

UNGUENTUM STANNI OLEATIS.—Stannous Oleate, 60 grains; Lard, 1 oz.

Of great utility in diseases of the nails; it overcomes the brittle, split and soft conditions of the nails, and gives them a brilliant lustre.—*B.M.J.* '84, ii. 753; *T.G.* '86, 494.

STAPHISAGRIÆ SEMINA.

STAVESACRE SEEDS.

FR., STAPHYSAIGRE; GER., STEPHANSKÖRNER; ITAL., STAFISAGRIA; SPAN., ESTAFISAGRIA.

The dried ripe Seeds of *Delphinium Staphisagria.*

Medicinal Properties.—The Seeds have been used in ointments for many years as a parasiticide for pediculi; the activity rests in an Oil which they contain in rather large quantity. The late Balmanno Squire experimented with this Oil, and also with the Seeds from which the Oil had been withdrawn by Ether, and found the latter inert. He successfully used an ointment made with the Oil in prurigo senilis.

Official Preparation.—Unguentum Staphisagriæ.

Not Official.—Lotio Staphisagriæ, Oleum Staphisagriæ, Unguentum Olei Staphisagriæ, and Delphinina.

Foreign Pharmacopœias.—Official in Belg., Dutch, Fr., Ital., Port., Mex. and U.S.

Descriptive Notes.—The Seeds are greyish-black, or blackish-brown if not quite ripe, about three lines long, and rather less in width, irregularly 4 to 5-sided with one side convex and the others more or less flattened or concave, the angles are sharp, and the testa is rough, wrinkled and deeply pitted. The albumen is whitish, oily, and has a minute embryo at the pointed end. No other *Delphinium* in cultivation has so large a seed; the species usually grown in botanic gardens as this plant has smaller seeds and lilac flowers and is *D. pictum*, Willd. *D. Staphisagria*, L., has blue flowers and is only half hardy.

Tests.—Stavesacre Seeds yield from 10 to 15 p.c. of ash. The Seeds contain a large proportion of fixed Oil. Four samples of Seeds examined in the author's laboratory when extracted with Ether yielded 31·4, 32·8, 33·9 and 34·8 p.c. of Oil.

Preparation.

UNGUENTUM STAPHISAGRIÆ. STAVESACRE OINTMENT.

Digest 2 of crushed Stavesacre Seeds in 8½ of Benzoated Lard on a water-bath for 2 hours, squeeze through calico, and dissolve 1 of Yellow Beeswax in the hot liquid, and finally stir until cold.

About half the strength of *B.P.* '85, and Yellow Beeswax is added.

Official in Ital., 1 and 3.

Not Official.

LOTIO STAPHISAGRIÆ. *Syn.* Nursery Hair Lotion.—Stavesacre Seeds, in rough powder, 2 oz.; Acetic Acid, 1 oz.; Water, 16. Boil for 10 minutes in a covered vessel, set aside till cold; then add Rectified Spirit, 2 oz.; Oil of Geranium, 2 minims; Oil of Lavender, 2 minims; Oil of Lemon, 4 minims; filter and add Glycerin, 1 oz.; Water, to 20 fl. oz. This is the Edinburgh Infirmary Pharmacopœia preparation.—*Pharm. Form.*

This has been incorporated in the *B.P.C.*

OLEUM STAPHISAGRIÆ.—The Oil obtained by expression from the Seeds.

It is insoluble in Alcohol (90 p.c.), but dissolves readily in hot Absolute Alcohol.

Tests.—Stavesacre Oil has a sp. gr. of about 0·918.

UNGUENTUM OLEI STAPHISAGRIÆ.—Expressed Oil, 60 minims; Lard, 1 oz. Used as a non-irritant remedy in scabies and in phtheiriasis.

DELPHININA. Delphinine.—Rhombic crystals or as a yellowish powder. An alkaloid obtained from Stavesacre. Insoluble in Water, but dissolves in acidulated Water, in Alcohol, Ether and Chloroform. It melts at about 192° C. (377·6° F.). It yields no colour reactions with acids, but when mixed with 1 to 2 volumes of Amyl Alcohol and treated with Sulphuric Acid, it yields an orange-coloured mass, which after several hours becomes dark rose-red and ultimately blue.

Dose.—$\frac{1}{60}$ grain = 0·0011 gramme; and repeat every 2 hours in neuralgia. —*L.M.R.* '87, 446; *L.* '87, ii. 879.

Not Official.

STEARIN.

COCOA-NUT STEARIN.

A white, soft, crystalline, fatty substance, unctuous to the touch, and possessing a strong, characteristic odour of Cocoa-nut.

This substance is more suitable for the manufacture of **suppositories** (especially in the cooler months of the year) than Oil of Theobroma; the m.p. of the latter is so near the temperature of the body that the suppositories made with it frequently take a very long time to melt. Mixtures of Stearin and Theobroma Oil give intermediate figures.

Tests.—Cocoa-nut Stearin has a sp. gr. at 60° C. (140° F.) of about 0·896. It has a m.p. of 28·9° C. (84° F.). It possesses a Saponification value of about 256, and an Iodine absorption of about 5. When distilled by the Reichart-Vollney test the number of c.c. of Tenth-normal Volumetric Barium Hydroxide Solution required to neutralise the distillate should amount to about 3 c.c.

Not Official.

STILLINGIA.

QUEEN'S ROOT.

The Root of *Stillingia sylvatica*, L., is official in U.S. It is stated to contain an alkaloid 'Stillingine' which should not be confounded with the eclectic remedy 'Stillingin.' Has been found useful in secondary syphilis, tuberculosis and cutaneous diseases.

Fluid Extract (1 in 1), average dose 2 c.c. (30 minims), is official in U.S., and forms a convenient means of exhibition.

STRAMONII FOLIA.

STRAMONIUM LEAVES.

FR., STRAMOINE; GER., STECHAPFELBLATTER; ITAL., STRAMONIO; SPAN., ESTRAMONIO.

The dried Leaves of *Datura Stramonium*, L.

They contain an alkaloid, Daturine, identical with Hyoscyamine.

The Stramonium Leaves official in the *U.S.P.* are required to yield not less than 0·25 p.c. of mydriatic alkaloids.

Medicinal Properties.—It is much used for spasmodic asthma in the form of **cigarettes** and **smoking mixtures.**

Dose.—*Ph. Ger.* maximum single dose, 0·2 gramme; maximum daily dose, 0·6 gramme.

Under the title **Daturæ Folia**, the dried leaves of *Datura fastuosa*, L., var. *alba*, Nees., are official in the *Ind.* and *Col. Add.*, for India, the Eastern and West Indian Colonies.

Official Preparation.—Tinctura Stramonii.

Not Official.—Extractum Stramonii, Fluidextractum Stramonii, Pulvis Stramonii Compositus, Folia Stramonii Nitrata, and Unguentum Stramonii.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Mex., Norw., Russ., Span., Swed., Swiss and U.S.

Descriptive Notes.—The Stramonium Leaves of commerce have, during the last few years, been frequently adulterated. The genuine leaves average about 3 to 6 in. (7 to 15 cm.) long, and 2 to 3 in. (5 to 8 cm.) broad, but are sometimes much larger, 9 by 6 in. (22 by 15 cm.), have an ovate outline, a petiole 1 in. (25 mm.) or more long, a sinuate margin with acute, rather distant triangular teeth of variable size, an unequal base, a minutely wrinkled surface when dried, a paler under surface, and a characteristic odour. The leaf has a bitterish, saline taste.

Under the microscope the powder is easily distinguished from that of Belladonna Leaves by the presence of cluster crystals and the absence of crystal-sand cells, by the epidermal cells not being striated, by the long hairs having rough or papillose walls and no terminal glands, and by the long palisade cells 5 or 6 times longer than broad, *Vogl. Atlas.* None of the adulterants hitherto used possess these characters.

The leaves of *Datura Tatula*, L., have usually a purplish tinge on the petiole often extending to the mid-rib.

The leaves of *D. fastuosa*, L., var. *alba*, Nees., are official in the *Ind.* and *Col. Add.* The leaves are not acuminate, and are obtusely sinuate, but not dentate.

Tests.—Stramonium Leaves yield from 10 to 15 p.c. of ash. It has been recommended that an ash limit of 15 p.c. and the microscopical characters should be given. The *U.S.P.* gives a method for the assay of the leaves which is identical with that for Belladonna Leaves given under Belladonnæ Folia. A weighed quantity of 10 grammes of Stramonium in No. 60 powder is employed for the determination.

Preparation.

TINCTURA STRAMONII. TINCTURE OF STRAMONIUM.

1 of Stramonium Leaves, percolated with Alcohol (45 p.c.) to yield 5.

B.P. '85 tincture was from the seeds, with Proof Spirit.

Tincture of Stramonium *U.S.P.* is required to contain 0·025 p.c. w/v of mydriatic alkaloids from Stramonium. The *B.P.* Tincture is not standardised, the *P.G.* does not include a tincture.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Official in Swiss, 1 of seeds in 10; *U.S.*, 1 of leaves in 10.

Tests.—Tincture of Stramonium has a sp. gr. of 0·950 to 0·964; it contains between 3 and 4 p.c. w/v of total solids and about 43 p.c. w/v of Absolute Alcohol. The *U.S.P.* assays the tincture by a similar process to that given for the assay of Fluid Extract of Belladonna Root given under Extractum Belladonnæ Fluidum. 100 c.c. of the tincture are evaporated to about one-tenth its volume, sufficient Alcohol (94·9 p.c.) is added, if necessary, to dissolve any separated substance, and the assay then continued as directed. The final multiplication by 10 being omitted in the calculation, as 100 c.c. of the tincture and not 10 c.c. of the fluid extract are used for the operation.

Not Official.

EXTRACTUM STRAMONII (*U.S.P.*).—The *U.S.P.* Extract is prepared by the evaporation, to a pilular consistence, of fluid extract of Stramonium at a temperature not exceeding 50° C. (122° F.). The extract is required to contain 1·0 p.c. of mydriatic alkaloids, and in the event of a greater alkaloidal content than the above being yielded when assayed, sufficient powdered Milk Sugar is added to reduce it to the standard.

Tests.—The *U.S.P.* employs a method identical with that for the assay of Extract of Belladonna Leaves given under the heading of Extractum Belladonnæ Viride. A weighed quantity of 5 grammes of the extract is employed for the determination.

FLUIDEXTRACTUM STRAMONII (*U.S.P.*).—An approximately 1 in 1 fluid extract prepared by exhausting Stramonium Leaves in No. 40 powder with a mixture composed of 2 volumes of Alcohol (94·9 p.c.) and 1 volume of Water, reserving the first percolate, evaporating the remainder at a temperature not exceeding 50° C. (122° F.) to a soft extract and dissolving this in the reserved percolate, finally adjusting the fluid extract to contain 0·25 p.c. of mydriatic alkaloids.

Tests.—The Fluid Extract of Stramonium is assayed by the *U.S.P.* by a process identical with that employed for the *U.S.P.* assay of Fluid Extract of Belladonna Root given under Extractum Belladonnæ Fluidum. A measured quantity of 10 c.c. of the Fluid Extract is employed for the determination.

PULVIS STRAMONII COMPOSITUS.—Stramonium Leaves, Datura Tatula, Cannabis Indica, and Lobelia Inflata, all in powder, of each 6 drm.; Nitre, in powder, 1 oz.; Eucalyptus Oil, 30 minims; mix thoroughly.

It burns well, gives off dense fumes, and affords great relief during asthmatic attacks.—*B.M.J.* '84, ii. 465; '87, ii. 494.

Several formulas, somewhat similar to the above, appear in the Hospital Pharmacopœias. **Himrod's cure** and several other similar preparations have also been recommended for asthma.

Folia Stramonii Nitrata.—Coarsely powdered Stramonium Leaves, 2; Potassium Nitrate, 1; Water, 3; soak, and after 12 hours, dry.

UNGUENTUM STRAMONII.—Extract of Stramonium, 10; Diluted Alcohol, 5; Hydrous Wool Fat, 20; Benzoinated Lard, 65.—*U.S.P.*

This has been incorporated in the *B.P.C.*

STRAMONII SEMINA.

STRAMONIUM SEEDS.

The dried ripe, black, reniform Seeds of *Datura Stramonium*, L.

The mixed alkaloids of Stramonium are generally called **Daturine**, but are the same as contained in Belladonna, viz., a mixture of Hyoscyamine and Atropine.

The dried pale brown, obovate, compressed Seeds of *Datura fastuosa*, L., var. *alba*, Nees., are official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies; also **Tinctura Daturæ Seminum** (1 in 4), dose 5 to 15 minims = 0·3 to 0·9 c.c.

Medicinal Properties.—Similar to those of Belladonna. Antispasmodic and sedative in spasmodic and bronchitic asthma. The Extract and the Tincture are used in convulsive cough as antispasmodics. The Extract has been given with success in hay asthma. Like Belladonna, it causes dilatation of the pupil.

Official Preparation.—Extractum Stramonii.

Not Official.—Guttæ Daturinæ.

Antidotes.—Same as for poisoning with Belladonna, p. 224; also Morphine subcutaneously, and Chloroform Inhalation.

Foreign Pharmacopœias.—Official in Port. (Estramonio), and Swiss.

Tests.—Stramonium Seeds yield from 2 to 3 p.c. of ash. The total alkaloids vary from 0·17 to 0·5 p.c., an average of 15 samples gave 0·35 p.c.; in the Leaves the percentage of alkaloid varied from 0·32 to 0·47 p.c., an average of 11 samples being 0·38 p.c. The *U.S.P.* requires that the dried leaves contain not less than 0·25 p.c. of mydriatic alkaloids.

Preparation.

EXTRACTUM STRAMONII. Extract of Stramonium.

A firm Extract, prepared by exhausting Stramonium Seeds, in No. 40 powder, with Alcohol (70 p.c.), and evaporation of the percolate.

B.P. '85 used Proof Spirit and removed the fixed Oil by Ether.

Dose.—$\frac{1}{4}$ to 1 grain = 0·016 to 0·06 gramme.

Not Official.

GUTTÆ DATURINÆ.—Daturine Sulphate, 2 grains; Water, 1 fl. oz.—*London Ophthalmic.*

Not Official.

STRONTII BROMIDUM.

STRONTIUM BROMIDE.

$SrBr_2 6H_2O$, eq. 352·92.

Fr., Bromure de Strontium; Ger., Strontiumbromid; Ital., Bromuro di Stronzio; Span., Bromuro Estroncico.

Colourless, translucent, hexagonal, deliquescent prisms, having a bitter saline taste.

It should be kept in well-stoppered glass bottles of a dark amber-tint in a cool place and protected as far as possible from exposure to the air, as it has a tendency to deliquesce. *U.S.P.* states that it is also occasionally efflorescent.

Strontii Bromidum Exsiccatum is also commercial. 69 of the anhydrous is equivalent to 100 of the crystallised salt.

Solubility.—2 in 1 of Water; 1 in 3 of Alcohol (90 p.c.).

Medicinal Properties.—Recommended in chronic gastritis and dilated stomach, in doses of 30 grains thrice daily, also in similar doses in epilepsy; is said by some to be less depressant than Potassium Bromide.—*B.M.J.* '92, ii. 1286; '95, i. 1089, 1252; *B.M.J.E.* '95, i. 76; *L.* '92, i. 47; '93, ii. 46; '95, i. 567; '96, ii. 871; '98, ii. 988. Many cases of epilepsy in which, if it gets a fair trial, it will have pre-eminence over other Bromide salts.—*L.* '07. i. 20. In acute gastric catarrh, *Pr.* liii. 130; in vomiting, *T.G.* '93, 115; in enteritis, *M.A.* '95, 239; in exophthalmic goître in children.—*B.M.J.* '98, ii. 1042. Increases coagulability of blood.—*L.* '08, i. 97.

15 grains 3 times daily, increasing the amount if necessary to 20 grains and then to 30 grains and 40 grains 3 times daily until seizures are under control. Whilst in some cases apparently of greater value than Potassium Bromide in controlling epileptic seizures, yet on account of the more rapid action of the latter, its more lasting effect, the smaller dose required, and lastly, its cheapness, the Potassium salt must be regarded as the more generally useful in the treatment of epilepsy.—*L.* '99, ii. 411.

It has an unpleasant, metallic taste.

Dose.—5 to 30 grains = 0·32 to 2 grammes.

3 drm. daily has been given for weeks without any unpleasant symptoms.—*L.* '98, ii. 988.

Foreign Pharmacopœias.—Official in Fr., Mex., Span. and U.S.

Tests.—Strontium Bromide melts when heated, and finally loses all its Water of crystallisation, equivalent to 30·4 p.c. The *U.S.P.* states that the anhydrous salt fuses at 630° C. (1166° F.). A crystal of the salt moistened with Hydrochloric Acid and introduced in a loop of platinum wire into a non-luminous flame gives a brilliant crimson coloration. The salt dissolves readily in Alcohol, but is precipitated from its alcoholic solution by the addition of Ether. It dissolves readily in Water, forming a clear solution, which should be neutral in reaction towards Litmus. A 5 p.c. aqueous solution affords on the addition of a saturated solution of Calcium Sulphate a white precipitate insoluble in diluted acids. Potassium Chromate Solution affords a yellow precipitate soluble in Acetic Acid; Ammonium Carbonate Solution yields a white precipitate soluble with effervescence in Acetic Acid. The aqueous solution affords with Silver Nitrate Solution a yellowish curdy precipitate practically insoluble in Ammonia Solution. The percentage of pure Strontium Bromide present in a specimen may be determined by titrating a weighed quantity of the salt with Tenth-normal Volumetric Silver Nitrate Solution, using Potassium Chromate Solution as an indicator of neutrality. The *U.S.P.* requires that a weighed quantity of 0·5 of a gramme when dissolved in about 50 c.c. of Water shall require not less than 27·4 (27·48) c.c. nor more than 29·4 c.c. of the volumetric solution to produce a permanent red colour, corresponding to at least 97 p.c. of pure Strontium Bromide.

The more generally occurring impurities are excess of Water, Copper, Lead, Iron and Zinc, Barium, Chlorides and Iodides. The aqueous solution either when faintly acidified with diluted Hydrochloric Acid, or when rendered faintly alkaline with Ammonia Solution, should not be darkened in colour by Hydrogen Sulphide, indicating the absence of Copper, Lead and Zinc. A weighed quantity of 1 gramme of the salt when mixed with an equal weight of Sodium Acetate, and the mixture dissolved in 5 c.c. of Distilled Water when rendered faintly acid with 3 to 5 drops of diluted Acetic Acid and mixed with 5 drops of Potassium Bichromate Solution should not afford a cloudiness within 3 minutes, indicating the limit of Barium. If the precipitate obtained by completely precipitating an aqueous solution of the salt with Silver Nitrate Solution be separated, shaken with Ammonia Solution and filtered, upon adding Nitric Acid in slight excess to the filtrate, no pronounced turbidity should result, indicating the absence of more than traces of Chlorides. If a little Chlorine Water diluted with an equal volume of Water be added carefully drop by drop to 10 c.c. of an aqueous

5 p.c. solution of the salt and the aqueous mixture be shaken with a little Carbon Bisulphide, the Carbon Bisulphide solution should assume a yellow or yellowish brown colour, and should be free from any violet tint, indicating the absence of Iodides.

STRONTII CINNAMAS. A white, or whitish, amorphous powder, soluble 1 in 100 of Water; insoluble in Alcohol (90 p.c.). It has been used suspended in 3 parts of Glycerin to 5 parts of Water in malignant disease.—*L.* '03, ii. 750.

Tests.—Strontium Cinnamate when strongly heated evolves an aromatic odour resembling Benzaldehyde, and finally burns leaving a carbonaceous residue which when dissolved in Water possesses a strongly alkaline reaction towards red Litmus paper, and effervesces on the addition of diluted Hydrochloric Acid, the solution when neutralised answering the tests distinctive of Strontium given under the heading of Strontii Bromidum. The Cinnamic Acid separated from the salt should possess the m.p. and answer the tests distinctive of Cinnamic Acid given under the heading of Acidum Cinnamicum.

STRONTII IODIDUM ($SrI_2 6H_2O$, eq. 446·02).—Translucent, colourless, hexagonal prisms or a white granular powder, readily soluble in Water, possessing a bitter saline taste. It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from contact with air, as it is of a deliquescent nature and liable to change to a yellow colour on exposure to the light. It has been used in place of the alkali Iodides in chronic endocarditis.

Dose.—7½ to 15 grains = 0·5 to 1 gramme.

Foreign Pharmacopœias.—Official in U.S.

Tests.—The salt melts when cautiously heated, gradually losing the whole of its Water of crystallisation, equivalent to 24·05 p.c., and leaving a residue of the anhydrous salt. It dissolves in Water, forming a clear solution which is neutral to Litmus, or but very faintly alkaline to red Litmus paper. It yields the tests distinctive of Strontium given under the heading of Strontium Bromide. The aqueous solution affords with Silver Nitrate Solution a yellow curdy precipitate insoluble in Nitric Acid, insoluble in Ammonia Solution, but soluble in Potassium Cyanide Solution. The aqueous solution when cautiously mixed with diluted Chlorine Water affords a yellowish coloration changing to blue on the addition of Mucilage of Starch. If the liquid before the addition of Starch solution be shaken with Carbon Bisulphide, the Carbon Bisulphide Solution assumes a strong violet colour. The percentage of pure Iodide present in a specimen may be determined by titrating a weighed quantity with Tenth-normal Volumetric Silver Nitrate Solution, using Potassium Chromate Solution as an indicator. The *U.S.P.* employs an excess of Tenth-normal Volumetric Silver Nitrate Solution, titrating the excess with Tenth-normal Volumetric Potassium Sulphocyanate Solution, using Ferric Ammonium Sulphate T.S. as an indicator. A weighed quantity of 0·5 of a gramme of the Iodide is dissolved in about 100 c.c. of Distilled Water, 25 c.c. of Tenth-normal Volumetric Silver Nitrate Solution added, 5 c.c. of Nitric Acid and 5 c.c. of Ferric Ammonium Sulphate Solution, the flask stoppered and shaken; not less than 1·7 c.c. nor more than 3·1 c.c. of Tenth-normal Volumetric Potassium Sulphocyanate Solution should be required to produce a permanent red tint, corresponding to 98 p.c. of pure Strontium Iodide.

The more generally occurring impurities are Copper, Lead, Iron and Zinc, Barium and Chlorides. Neither the aqueous solution slightly acidified with diluted Hydrochloric Acid nor an aqueous solution made faintly alkaline with Ammonia should afford any darkening in colour on the addition of Hydrogen Sulphide, indicating the absence of Copper, Lead, Iron and Zinc. The presence of Barium may be detected by a test similar to that described under Strontium Bromide. If the precipitate obtained by completely precipitating an aqueous solution of the salt with Silver Nitrate, be separated, shaken with Ammonia and filtered, the filtrate rendered faintly acid with Nitric Acid should not yield any pronounced turbidity, indicating the absence of more than traces of Chlorides.

STRONTII LACTAS ($Sr(C_3H_5O_3)_2\ 3H_2O$, eq. 317·32).—A white granular powder, or in crystalline nodules, soluble 1 in 3 of Water. Has been recommended for albuminuria in parenchymatous nephritis.—*L.* '92, i. 47; '95, i. 567; '96, i. 255; *T.G.* '94, 461; *B.M.J.E.* '96, ii. 76; '97, ii. 40. Excellent diuretic in Bright's disease.—*L.* '94, ii. 992.

Dose.—20 to 30 grains = 1·3 to 2 grammes.

Official in Fr. and Mex.

Tests.—Strontium Lactate when heated to 110° C. (230° F.) loses its Water of crystallisation, equivalent to 16·9 p.c. At a still higher temperature it yields inflammable vapours, and burns leaving a carbonaceous residue which effervesces strongly on the addition of Hydrochloric Acid and which produces a distinctive crimson flame test of Strontium. The salt dissolves in Water, yielding a clear solution which is slightly acid in reaction towards blue Litmus paper. It answers the tests distinctive of Strontium given under the heading of Strontii Bromidum. The aqueous solution when acidified with Sulphuric Acid and treated with Tenth-normal Volumetric Potassium Permanganate Solution decolorises the Permanganate, evolving simultaneously an odour of Aldehyde. The percentage of pure Strontium Lactate may be determined by extracting the carbonaceous residue left on igniting the carefully dried salt, with boiling Water, until the washings no longer effect Methyl Orange Solution; the filtrate and washings being titrated with Normal Volumetric Sulphuric Acid Solution, using Methyl Orange Solution as an indicator of neutrality. A weighed quantity of 1·33 gramme of the salt thus treated should require for complete neutralisation not less than 9·9 c.c. of the Normal Volumetric Acid Solution, corresponding to at least 98·6 p.c. of the pure salt.

The more generally occurring impurities are Arsenic, Copper, Lead, Iron and Zinc, Barium, Carbonates and Oxalates, Chloride, Butyrate, Propionate, and readily charred organic impurities. Arsenic, Copper, Lead, Iron and Zinc may be tested for as described under Strontium Bromide or Strontium Iodide, as also may Barium. The 5 p.c. aqueous solution of the salt should be perfectly clear leaving no weighable residue, and no effervescence should occur on mixing 0·5 of a gramme of the salt with 1 c.c. of Sulphuric Acid, indicating the absence of Carbonates and Oxalates. The aqueous solution of the salt should not afford more than a slight opalescence on the addition of Silver Nitrate Solution, indicating the absence of more than traces of Chloride. A solution of the salt in concentrated Sulphuric Acid should be free from perceptible or penetrating odour, even after gently heating, indicating the absence of Butyrate and Propionate, and this Sulphuric Acid Solution should not become in 10 minutes more than a pale straw yellow colour, indicating the absence of readily charred organic impurities. The salt should not lose, when carefully dried at the temperature mentioned above, more than its proper quantity of Water of crystallisation.

STRONTII SALICYLAS ($Sr(C_7H_5O_3)_2\,2H_2O$, eq. 394·72).—A white powder, slightly soluble in Water.

It should be kept in well-stoppered glass bottles of a dark amber tint in a cool atmosphere and protected as far as possible from the light.

Has been recommended as an intestinal antiseptic; also in gouty and rheumatic conditions.—*C.D.* '95, i. 291; *P.J.* '96, ii. 63; '97, ii. 118.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Official in U.S.

Tests.—Strontium Salicylate decomposes on heating, giving off inflammable vapours and an odour of Phenol, and leaving a residue of Strontium Carbonate. This residue dissolves with effervescence in Hydrochloric Acid, giving a solution which affords the distinctive flame test for Strontium. The salt dissolves in Water, forming a clear solution which is faintly alkaline in reaction towards red Litmus paper. This aqueous solution answers the tests distinctive of Strontium given under Strontii Bromidum. A 1 p.c. aqueous solution of the salt affords with Ferric Chloride T.S. a deep violet coloration. A 5 p.c. aqueous solution affords with Copper Sulphate T.S. a green coloration. A small quantity of the salt when warmed with a few drops of concentrated Sulphuric Acid and a little Methyl Alcohol evolves the distinctive odour of Methyl Salicylate.

The *U.S.P.* method of determination is a gravimetric one, 0·5 of a gramme of the salt is moistened with 1 c.c. of Sulphuric Acid, the mixture cautiously heated until no more vapours are given off, the residue again moistened with a few drops of the acid, again heated and finally ignited until of a constant weight. The *U.S.P.* requires that the residue of Strontium Salicylate should weigh not less than 0·227 gramme corresponding to not less than 98·5 p.c. of pure Strontium Salicylate. The Salicylic Acid separated by acidification from the aqueous solution, washing the precipitate till free from mineral acid and carefully drying, should possess the m.p. and answer the tests distinctive of Salicylic Acid given under Acidum Salicylicum.

The more generally occurring impurities are Copper, Lead, Iron and Zinc, Barium, Carbonates and Chlorides. The same methods may be employed for the detection of Copper, Lead, Iron, Zinc and Barium as are employed in the examination of Strontium Bromide and Strontium Iodide. The concentrated aqueous solution should afford a white crystalline precipitate but yield no effervescence on the addition of diluted Nitric Acid, indicating the absence of Carbonate, and if the crystalline precipitate be filtered off, the filtrate should not afford a distinct turbidity on the addition of Silver Nitrate Solution, indicating the absence of more than traces of Chlorides. The absence of excess of Water of crystallisation may be ensured by a determination of the loss of weight on heating the salt at 100° C. (212° F.).

STROPHANTHI SEMINA.

STROPHANTHUS SEEDS.

FR., STROPHANTHUS; GER., STROPHANTHUSSAMEN; ITAL., STROFANTO;
SPAN., ESTROFANTO.

The dried ripe Seeds of *Strophanthus Kombé*, freed from the awns.

The commercial seed usually contains the seeds of other species in addition to those of *S. Kombé*.—*P.J.* (3) xix. 660. The active principle is a glucoside, **Strophanthin.**

Medicinal Properties.—A cardiac tonic. Especially valuable in mitral regurgitation with failure of compensation, and in aortic regurgitation accompanied by cardiac insufficiency. The active principle being very soluble and diffusible, Strophanthus acts with such rapidity that it is more useful than Digitalis in promptly stimulating extreme or sudden cases of cardiac failure. Of great value in avoiding both the cardiac embarrassment so frequently fatal in acute pneumonia and the collapse which may occur at the crisis. It is easily eliminated, it is not cumulative, it can be administered over a long period of time, and, unless there be marked gastro-intestinal catarrh, it has no tendency to produce digestive disturbance. It has acted beneficially in many cases in which Digitalis has failed or has disagreed.

Strophanthus acts more energetically on the heart than on the vessels, whereas Digitalis acts on the vessels as much as, or even more than, on the heart. Digitalis thus possesses the power of increasing arterial tension, and so of putting extra strain on the heart; therefore, in those cases in which pulse tension is high, Strophanthus is to be preferred.

A more powerful cardiac tonic than Digitalis and superior as a diuretic.—*B.M.J.* '95, i. 368; *B.M.J.E.* '97, ii. 3; '98, i. 12; *T.G.* '98, 36.

In Graves' disease.—*L.* '93, ii. 822. In alcoholism.—*L.* '94, ii. 212.

As to the disparity in the results obtained by different observers, Fraser remarks that, 'there are several species of the genus, and that while the therapeutic effects have been determined with only one of these species, the seeds of several of the others have indiscriminately been substituted. The whole fruit, and not the seeds only, and immature seeds, poor in the active principle and rich in irritating resin, have been used to prepare the Tincture; seeds already exhausted with Alcohol have been re-sold in the market; and further, even when good seeds were used, Petroleum Ether has been substituted for Ethylic Ether, preparatory to percolation with Rectified Spirit, with the result that the Tincture (1885) contained much resin, which produced stomach and intestinal disorder.'

Official Preparations.—Extractum Strophanthi and Tinctura Strophanthi.

Not Official.—Strophanthin and Ouabain.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Ital., Jap., Mex., Norw., Russ., Span., Swiss and U.S.

Descriptive Notes.—For many years past the Strophanthus seeds of commerce have been almost invariably a mixture derived from different species. The official seeds are limited to those of *Strophanthus Kombé*, Oliver. They are about $\frac{5}{8}$ in. (15 mm.) long and rather more than $\frac{1}{8}$ in. (4 mm.) broad (15 mm. long, 4 to 5 mm. wide and 2 to 2·5 mm. in thickness, *U.S.P.*; 17 mm. long, 5 mm. broad, 3 mm. thick, *P.G.*), of a greenish-fawn colour and covered with silky adpressed hairs, linear, elliptical, acuminate, compressed, rounded at the base and having a longitudinal ridge on one side from $\frac{1}{8}$ in. below the centre to the apex of the seed, the cotyledons are straight, surrounded with a thin endosperm; the odour is characteristic, the taste very bitter.

The seeds vary a little in size and shape according to their position in the pod, the lowest being usually rather longer, more acuminate, and furnished with longer awns.

The pods and seeds of *Strophanthus Courmontii*, Sacl., var. *fallax*, Holmes, so closely resemble in size, shape and colour those of *S. Kombé* that it is practically impossible to distinguish them by sight, although the flowers and leaves of the two species are quite distinct. There are microscopical differences between the two seeds, but it needs an expert to detect them.

The colour of the seeds appears brownish or greenish-grey, according to the incidence of the light and the position of the observer with regard to it, due to the disposition of the hairs. But when a section of the seed is immersed in a mixture of 8 parts concentrated Sulphuric Acid (*B.P.*) strength and 2 of Water, a deep green colour rapidly appears in the albumen surrounding the embryo to which the colour gradually extends. The seeds of no other known species except those of *S. hispidus*, DC. give this reaction, and the seeds of that species are smaller and dark brown in colour. They also contain the same active principle, but just as there are seeds closely resembling those of *S. Kombé*, which slowly give a pink reaction, so there is a seed closely resembling *S. hispidus*, viz., *S. Arnoldianus*, De Wild. and Dur., in its brown colour and size, which gives a pink reaction, so that in either case a colour test is necessary. Several of the species are not regarded by the African natives as poisonous, but the woolly Zambesi seeds, *S. Nicholsoni*, Holmes, that have appeared in commerce, distinguished by the longer white hairs hiding the apex of the seed, and those of *S. gratus*, Franch., are recognised by the natives as poisonous and are used in making arrow poison. The seeds of the latter are the only W. African kind imported into commerce that are quite hairless. Both of these give a pink coloration with Sulphuric Acid, but it is probable that this reaction, though useful to distinguish other seeds from those of *S. Kombé*, does not always depend upon the presence of Ouabain as it does in the seeds of *S. gratus*. At the present time it is possible to obtain commercially in London the seeds of *S. Kombé* unmixed with other kinds. It should be noted that the acid used for testing is apt to become weaker by keeping, and recently mixed acid should therefore be employed, as a weak acid does not readily give the green reaction. The *P.G.* points out that the starch grains in the official seed do not exceed 0·008 mm., and the *U.S.P.* that the hairs appear under the microscope of a light brownish-green colour, are thin-walled, 1-celled, and 1 mm. or less in length.

Tests.—Strophanthus seeds contain from 3 to 4 p.c. of ash, and 5 p.c. is rarely exceeded. The *B.P.* states that Sulphuric Acid colours the endosperm and sometimes the cotyledons a dark green, indicating the presence of Strophanthin. The *B.P.* employs a concentrated acid. The author found from an examination of commercial tinctures of Strophanthus that the use of a Sulphuric Acid slightly diluted with Water gave a more definite reaction. Holmes has suggested (*P.J.* '02, i. 254) that in a future edition of the *B.P.* the words 'Sulphuric Acid' should be replaced by 'a freshly prepared solution containing 8 parts of Sulphuric Acid and 2 of Distilled Water.' Several processes have been suggested for the chemical assay of Strophanthus, but not one of them is entirely satisfactory. The following process described (*P.J.* '96, ii. 463; '02, ii. 281, 304) is easy of manipulation and yields results which possess a certain value as a criterion of the activity of the preparation. It is based upon the determination of the amount of Strophanthidin produced on the hydrolysis of Strophanthin. A measured quantity of 50 c.c. of the tincture is diluted with 50 c.c. of Water and the Alcohol removed by distillation. The filtered aqueous liquid, after being shaken with Chloroform, is digested for 1 hour on a water-bath with diluted Sulphuric Acid; after cooling, the turbid liquid is agitated with 3 successive small quantities of Chloroform; the chloroformic layer in each case is separated, transferred to a tared flask, the Chloroform removed by evaporation, the residue of Strophanthidin dried below 65·6° C. (150° F.) and when constant weighed. The percentage of Strophanthidin found divided by 0·365 corresponds to the percentage of Strophanthin present. The physiological method of assay is also in vogue, but it is doubtful whether, in the present state of knowledge, the physiological process possesses any advantages over the chemical. Tinctures made from the seeds answering the official requirements, when carefully prepared, have yet to be shown wanting in activity. So-called physiological standardisation of galenicals leaves much to be desired. A method for rapidly and approximately estimating Strophanthin in the extract and tincture by the optical rotation has been suggested (*C.D.* '98, ii. 289).

Preparations.

EXTRACTUM STROPHANTHI. EXTRACT OF STROPHANTHUS.

1 of Strophanthus Seeds, exhausted with Purified Ether, and dried, then percolated with Alcohol (90 p.c.) until 10 of percolate is obtained; concentrate this by evaporation to a thick liquid, and add Milk Sugar *q.s.* to yield 2 of Extract, in powder.

Dose.—¼ to 1 grain = 0·016 to 0·06 gramme.

Official in Mex.

TINCTURA STROPHANTHI. TINCTURE STROPHANTHUS.

Percolate 1 of Strophanthus Seeds, in No. 30 powder, with Alcohol (70 p.c.) until 20 is obtained, and dilute with Alcohol (70 p.c.) to yield 40. (1 in 40)

B.P. 1898 reduced the strength from 1 in 20 to 1 in 40, making the dose uniform with Tincture of Digitalis.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Foreign Pharmacopœias.—Official in Ital., 1 in 20; Norw., 1 and 10; Austr., Belg., Dan., Dutch, Fr., Ger., Jap., Russ., Span., Swed., Swiss and U.S., 1 in 10; Mex., 1 in 5. All by weight except U.S. The *Brussels Conference* agreed to a strength of 10 p.c., prepared by percolation with Alcohol (70 p.c.), the seeds not to be freed from fat.

Tests.—Tincture of Strophanthus has a sp. gr. of 0·890 to 0·894; it contains from 0·4 to 0·9 p.c. w/v of total solids and about 68 p.c. w/v of Absolute Alcohol. 2 c.c. of the tincture evaporated on a water-bath and the residue, when cool, moistened with a drop of a freshly prepared solution containing 8 parts of Sulphuric Acid and 2 of Distilled Water should yield a green and not a red coloration. A standard of 0·2 p.c. has been suggested for the tincture. A method of determining the Strophanthin is described under Strophanthus Semina. Eight samples of tincture obtained from houses of the highest repute examined in the author's laboratory showed percentages of Strophanthin varying from 0·082 to 0·301 p.c., with an average of 0·109 p.c. When tested by the Sulphuric Acid test, as described above, only one sample (that of Fraser's) gave a green coloration, the others yielding either a yellow or purple coloration. Two samples of the *B.P.* tincture prepared in the author's laboratory both gave pure green colorations.

Not Official.

STROPHANTHIN.—A pale yellow amorphous powder, or in white microscopic crystalline plates. It possesses an intensely bitter taste and is extremely poisonous.

Solubility.—Freely in Water and in Alcohol (90 p.c.); practically insoluble in Choroform, Ether, and in Carbon Bisulphide.

Dose.—$\frac{1}{300}$ to $\frac{1}{200}$ grain = 0·0002 to 0·00032 gramme.

It is official in the *U.S.P.* and is described as a glucoside or mixture of glucosides obtained from Strophanthus. It is also official in the *Fr. Codex* and *Mex.*

It should be kept in well-stoppered glass bottles of a dark amber tint and exposed as little as possible to the light.

Tests.—Strophanthin when heated darkens at about 146° C. (294·8° F.), becomes pasty at 165° C. (329° F.), and melts at 172·5° C. (342·5° F.). The *U.S.P.* states that it commences to fuse at 170° C. (338° F.), and is not completely melted until the temperature reaches 190° C. (374° F.). *Fr. Codex* (1908) gives the melting point as 185° C. (365° F.). It dissolves readily in Water, the solution being neutral in reaction to Litmus paper and dextrogyrate. A trace of the substance when moistened with a freshly prepared solution containing 8 parts of Sulphuric Acid and 2 of Distilled Water yields an emerald-green coloration, subsequently changing to brown. An aqueous solution yields on the addition of a trace of Ferric Chloride T.S. and a few c.c. of Sulphuric Acid a reddish-brown precipitate, turning dark green after 1 or 2 hours. Tannic Acid Solution throws down from an aqueous solution a copious white precipitate, which redissolves on agitation until an excess of the reagent has been added. The usual reagents employed as alkaloidal precipitants, *e.g.*, Potassio-mercuric Iodide Solution and Iodo-potassium Iodide Solution, produce no precipitate in solutions of the glucoside. Potassio-cupric Tartrate (Fehling's) Solution produces no red precipitate of Cuprous Oxide when boiled with the aqueous solution, but if an aqueous solution be heated to 70° C. (158° F.) with a small amount of Diluted Sulphuric Acid, the Strophanthin undergoes hydrolysis with the formation of Glucose and Strophanthidin; the latter separating out as a flocculent precipitate which can be filtered off, the filtrate if boiled with Potassio-cupric Tartrate (Fehling's) Solution will now yield a red precipitate of Cuprous Oxide. When ignited with free access of air it should leave no weighable residue.

Ouabain.—White, odourless and tasteless slender transparent needles, practically insoluble in cold Water and Alcohol (90 p.c.), insoluble in Ether and in Chloroform. Recommended medicinally in half the doses of Strophanthin, in cases where Strophanthus and Digitalis both fail. The action is similar to Strophanthin. It is obtained from *Acokanthera Schimperi*, Oliv. (*S. Ouabaio*, Cath.), of the same natural order as Strophanthus, and from the seeds of *S. gratus*.

STRYCHNINA.

STRYCHNINE.

$C_{21}H_{22}N_2O_2$, eq. 331·75.

Translucent, colourless rhombic prisms or a white crystalline powder. Permanent in the air. This alkaloid is odourless, but possesses an intensely bitter taste and is extremely poisonous. It may be obtained from the dried ripe seeds of *Strychnos Nux Vomica*, *Ignatia Amara*, and other species of *Strychnos*.

Strychnine is official in the *B.P.* and *U.S.P.*, but not in the *P.G.*

Solubility.—1 in 6000 to 8000 of Water; 1 in 170 of Alcohol (90 p.c); 1 in 250 of Alcohol (70 p.c.); about 1 in 400 of Alcohol (60 p.c.); 1 in 800 of Alcohol (45 p.c.); 1 in 4200 of Alcohol (20 p.c.); 1 in 350 of Absolute Alcohol; 1 in 6 of Chloroform; nearly insoluble in Ether.

Medicinal Properties.—Similar to those of Nux Vomica; gastric, cardiac, and general tonic; useful in the treatment of reflex or functional paralysis; and of peripheral neuritis and paralysis due to Alcohol, tobacco, or diphtheria; also in cases of lead-palsy. It increases peristalsis, and is therefore a useful addition to other purgatives. Recommended in chronic alcoholism, muscular tremors, tobacco amblyopia, impotence and nervous exhaustion. For other uses and for its contra-indications, *see* Nux Vomica. It has a cumulative action and is a very active poison.

An antidote in Chloroform poisoning.—*B.M.J.E.* '94, i. 47. In snake-bites. —*T.G.* '93, 542; '94, 517.

In the treatment of surgical shock 10 minims of Liquor Strychninæ given subcutaneously just before commencing anæsthesia, followed after the operation by 5 minims subcutaneously injected every 2 hours for several hours if called for.—*L.* '02, i. 1025, 1063, 1210, 1357, 1497; *B.M.J.* '99, ii. 1471.

In diabetes insipidus good results are stated to have followed the injection of $\frac{1}{20}$ grain of the Nitrate on each of the first 2 days, and $\frac{1}{12}$ grain on the third.—*B.M.J.E.* '04, ii. 71; *B.M.J.E.* '06, ii. 72.

Of undoubted value in collapse from cardiac weakness following infantile diarrhœa. Best administered in doses of ½ minim of the Liquor Strychninæ.—*Pr.* lxxv. 508.

In beri-beri $\frac{1}{50}$ grain administered twice daily caused a rapid improvement in a week.—*L.* '05, ii. 540.

In surgical shock, notwithstanding an article which appeared by a distinguished surgeon, in which its administration in large doses hypodermically was advocated, Strychnine is stated to be of very little value (*L.* '05, i. 780) in the treatment, and in many cases it directly contributed to a fatal issue.

May be made use of to prevent surgical shock if it can be administered in small doses at reasonable intervals for, say, a week or 10 days previous to an operation.—*L.* '05, i. 851.

In the treatment of shock, stimulants, and especially Strychnine, are absolutely contra-indicated, as they tend to increase the severity of the condition and to retard recovery. Adrenalin, Hemisine, or Ergot are recommended.—*L.* '05, i. 854.

To the exhausted anæmic, or overworked debilitated person, Strychnine, 5 to 7 minims of the liquor, is the hypnotic *par excellence.*—*F.T.* '07, 70.

Morphinomania treated successfully by Atropine and Strychnine.—*B.M.J.* '07, i. 1173.

Strychnine, especially in form of injection and Nux Vomica, are powerful heart tonics.—*B.M.J.* '06, ii. 987.

Dose.—$\frac{1}{60}$ to $\frac{1}{15}$ grain = 0·0011 to 0·0044 gramme.

Prescribing Notes.—*May be given in the form of* **pill** *well triturated with Milk Sugar and the addition of 'Diluted Glucose,' q.s., but it is more frequently prescribed in solution.*

Antidotes.—Animal Charcoal or Tannic Acid, followed by an emetic, or the stomach-tube. Potassium Bromide, in ½ oz. in Water, with 30 grains of Chloral. 2 drm. of the Bromide, with or without 10 grains of Chloral, may be given every 15 or 20 minutes if necessary. Amyl Nitrite inhalations, the Amyl being poured freely on a handkerchief and held close to the nose. The patient may be kept fully under Chloroform or Ether. Curare, ⅓ grain, by hypodermic injection. *Artificial respiration if possible.—Murrell.*

A case of recovery after taking 3 grains of Strychnine.—*L.* '67, ii. 41, 118.

8 grains of Morphine said to be an antidote for 1 grain of Strychnine.—*L.* '71, ii. 840.

Foreign Pharmacopœias.—Official in Fr., Port., Mex., Span. and U.S.

Tests.—Strychnine melts at 265° to 266° C. (509° to 510·8° F.); the *U.S.P.* says 268° C. (514·4° F.). It dissolves very sparingly in Water, the aqueous solution being alkaline towards red Litmus paper and being lævogyrate. Even in highly dilute solution it possesses an extremely bitter taste, but the solution should be tasted with extreme caution. A crystal moistened with Sulphuric Acid produces a colourless solution, which, on the addition of a minute crystal of Potassium Bichromate, assumes an intense purple-violet coloration, passing from red to yellow. A similar coloration is produced when Sulphuric Acid containing a one-thousandth part of Potassium Permanganate is brought into contact with a crystal of the alkaloid, but the rotation of tints is very rapid and the reagent itself is apt to give a more or less purple-violet colour with Sulphuric Acid. With a drop of Sulphuric Acid containing a trace of Ammonium Vanadate (1 gramme of Ammonium Vanadate in 100 c.c.) the alkaloid produces a deep purple-violet coloration. Sulphuric Acid containing a trace of Potassium Iodate also produces with the alkaloid a purple-violet coloration, changing to reddish-purple. The free alkaloid may be determined by titration with Tenth-normal Volumetric Sulphuric Acid Solution, using Iodeosin Solution as an indicator of neutrality; 1 c.c. of Tenth-normal Volumetric Sulphuric Acid is equivalent to 0·033175 gramme of Strychnine.

The more generally occurring impurities are Brucine, Sugar and other readily charred organic impurities, and mineral impurities. The alkaloid should not be coloured on the addition of concentrated Nitric Acid, indicating the absence of Brucine. It should dissolve in cold concentrated Sulphuric Acid without alteration in colour, indicating the absence of Sugar and readily charred organic impurities. When ignited with free access of air it should leave no weighable residue.

STRYCHNINÆ HYDROCHLORIDUM.

STRYCHNINE HYDROCHLORIDE.

HYDROCHLORATE OF STRYCHNINE.—*B.P.* '85.

$\mathbf{C_{21}H_{22}N_2O_2,HCl,2H_2O}$, eq. 403·70.

Translucent, colourless, prismatic crystals or white silky crystalline needles; it is efflorescent in dry air, and should therefore be kept in well-stoppered bottles. It possesses an intensely bitter taste. It is officially described as the Hydrochloride of an alkaloid obtained from Nux Vomica and from other species of Strychnos; but would have been preferably described as the Hydrochloride of the alkaloid Strychnine.

Strychnine Hydrochloride is only official in the *B.P.*; in the *U.S.P.* both the Nitrate and the Sulphate are official; in the *P.G.* only the Nitrate is official.

Solubility.—1 in 35 Water, 1 in 73 Alcohol (90 p.c.); insoluble in Ether.

Medicinal Properties.—*See* 'Strychnina.'

Dose.—$\frac{1}{60}$ to $\frac{1}{15}$ grain = 0·0011 to 0·0044 gramme.

Ph. Ger. maximum single dose, 0·01 gramme; maximum daily dose, 0·02 gramme of the Nitrate.

Prescribing Notes.—*In* solution, tablet *or* pill. *A good pill is made by well triturating with Milk Sugar and massing with 'Diluted Glucose.' Strychnine is usually given immediately after a meal. Solution of Strychnine is frequently prescribed with Solution of Arsenic, in which case the Liquor Arsenici Hydrochloricus should be ordered and not the Alkaline Liquor.*

Official Preparation.—Liquor Strychninæ Hydrochloridi.

Not Official.—Mistura Strychninæ Acida, Strychninæ Nitras, Strychninæ Sulphas, Strychnine Acetate, Strychnine Hydrobromide, Strychnine Valerianate.

Incompatibles.—Alkalis and Alkaline Carbonates, Bromides and Iodides, Liquor Sodii Arsenatis, and Liquor Arsenicalis.

Foreign Pharmacopœias.—Official in Mex.

Tests.—Strychnine Hydrochloride when heated loses its Water of crystallisation, slowly and incompletely at 100° to 110° C. (212° to 230° F.), readily and completely at 130° to 135° C. (266° to 275° F.). If of the pharmacopœial formula, it should lose theoretically 8·8 p.c., but the balance of opinion seems to be that a salt containing the full amount of Water of crystallisation is not a commercial article. The Report of the Committee of Reference in Pharmacy does not go far in elucidating the matter; it is content with stating that the composition of the salt needs reinvestigating, and that the temperature at which this salt is stated to lose its Water of crystallisation is too low. The *B.P.* authorities themselves do not appear to be over-confident of the correctness of the formula, as they state under the heading of Tests that when dried at a temperature of 100° C. (212° F.) it should lose from 7·3 to 8·8 p.c. of moisture. Commercial specimens of the salt lose about 7·3 p.c. of Water at temperatures between 100° and 130° C. (212° and 266° F.). The salt dissolves in Water, forming a clear solution, which should be neutral in reaction towards Litmus paper. It should afford on the addition of Ammonia Solution a white precipitate soluble in Ether. If the ethereal solution be separated, evaporated to dryness, it should yield a residue which answers the tests distinctive of Strychnine given under that heading. An aqueous solution of the salt acidified with Nitric Acid yields on the addition of Silver Nitrate Solution a white, curdy precipitate, which, when separated, washed and treated with Ammonia Solution, dissolves and is again reprecipitated on acidification with Nitric Acid. An aqueous solution of the salt when acidified with diluted Hydrochloric Acid should yield no turbidity on the addition of Barium Chloride Solution, indicating the absence of Sulphates.

Preparation.

LIQUOR STRYCHNINÆ HYDROCHLORIDI. SOLUTION OF STRYCHNINE HYDROCHLORIDE. SOLUTION OF HYDROCHLORATE OF STRYCHNINE.—*B.P.* '85.

Strychnine Hydrochloride, $17\frac{1}{2}$ grains; Alcohol (90 p.c.), 1 fl. oz.; Distilled Water, *q.s.* to yield 4 fl. oz. (1 in 100)

Dose.—2 to 8 minims = 0·12 to 0·5 c.c.

11 minims contain $\frac{1}{10}$ grain of Strychnine Hydrochloride.
2 minims subcutaneously injected for peripheral paralysis.

Not Official.

MISTURA STRYCHNINÆ ACIDA.—Solution of Strychnine Hydrochloride, 3 minims; Diluted Nitro-Hydrochloric Acid, 15 minims; Glycerin, 30 minims; Compound Infusion of Gentian, to 1 fl. oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

STRYCHNINÆ NITRAS. Strychnine Nitrate. ($C_{21}H_{22}N_2O_2$. HNO_3, eq. 394·33).—Colourless, silky, crystalline needles, possessing an extremely bitter taste. It is the Nitrate of the alkaloid Strychnine, and is official in the *U.S.P.* and *P.G.*, but not in the *B.P.*

It should be kept in well-stoppered glass bottles.

Solubility.—1 in 63 of Water and 1 in 120 of Alcohol (90 p.c.).

Official in Austr., Belg., Dan., Dutch, Ger., Hung., Ital., Jap., Mex., Norw., Russ., Swed., Swiss and U.S.

Tests.—Strychnine Nitrate when heated decomposes. It dissolves in Water, forming a clear solution possessing even when highly diluted an extremely bitter taste (it should be tasted with extreme caution), which is neutral in reaction towards Litmus paper and lævogyrate. When heated with Hydrochloric Acid a bright red coloration is produced. The alkaloid separated from an aqueous solution of the salt by precipitation, and solution by an immiscible solvent should answer the tests distinctive of Strychnine given under that heading. A solution of the salt poured carefully upon Sulphuric Acid containing a little Diphenylamine develops a blue coloration at the junction of the two liquids. The salt when moistened with Sulphuric Acid should not assume more than a faint yellow colour, indicating the limit of Brucine. It should leave no weighable residue when ignited with free access of air, indicating the absence of mineral impurities.

Hypodermic Tablets are made containing $\frac{1}{40}$ and $\frac{1}{100}$ grain Strychnine Nitrate; and $\frac{1}{30}$, $\frac{1}{32}$, $\frac{1}{60}$, and $\frac{1}{150}$ grain of Strychnine Sulphate.

STRYCHNINÆ SULPHAS. Strychnine Sulphate [$(C_{21}H_{22}N_2O_2)_2$. H_2SO_4, $5H_2O$, eq. 850·24]. — Colourless, or white, odourless, efflorescent, prismatic crystals, possessing an intensely bitter taste. It is the Sulphate of the alkaloid Strychnine.

It should be kept in well-stoppered glass bottles, as it has a tendency to effloresce in dry air.

Solubility.—1 in 48 of Water; 1 in 35 of Alcohol (90 p.c.).

Official in Fr., Mex., Port., Span. and U.S.

Tests.—Strychnine Sulphate when heated to a temperature of 100° C. (212° F.) loses its Water of crystallisation, equivalent to 10·59 p.c. Anhydrous Strychnine Sulphate melts at 200° C. (392° F.). It dissolves in Water, forming a clear solution possessing an extremely bitter taste, and which should be tasted with extreme caution. This solution is neutral in reaction towards Litmus paper. The alkaloid separated by treatment with Ammonia Solution, and an immiscible solvent should answer the tests characteristic of Strychnine given under that heading. The aqueous solution affords with Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid. It should yield only a faint yellow coloration when mixed with concentrated Nitric Acid, indicating the absence of Brucine. When ignited with free access of air it should leave no weighable residue, indicating the absence of mineral impurities.

Strychnine Acetate, in colourless, acicular crystals, or as a white crystalline powder, soluble in dilute Acetic Acid; **Strychnine Hydrobromide**, in colourless, translucent, prismatic crystals, or as light, white, silky, acicular crystals, soluble 1 in 65 of Water, 1 in 96 of Alcohol (90 p.c.); and **Strychnine Valerianate**, in pearly white crystals, or as a white crystalline powder, possessing an odour of Valerianic Acid, slightly soluble in Water; are non-official salts of Strychnine, which have in recent years received attention in medical literature.

Strychninæ Meta-vanadas has been used in tuberculosis, neurasthenia and atonic dyspepsia.—*B.M.J.E.* '01, ii. 88.

STYRAX PRÆPARATUS.

PREPARED STORAX.

Fr., Styrax Liquide Purifié; Ger., Storax; Ital., Storace Liquido; Span., Estoraque Liquido.

A light brown, or brownish-yellow semi-liquid, thick balsam, transparent in thin layers, possessing a pleasant aromatic odour, and a sharp pungent balsamic taste. It is obtained from the trunk of *Liquidambar orientalis.* The official product is purified by solution in Ethylic Alcohol, filtration and evaporation of the solvent.

Owing to loss of volatile constituents of the resin during the evaporation of the solvent, Ethylic Alcohol is unsuitable for purification of the resin, and a more volatile solvent would have been preferable, the only objection being greater inflammability. The use of Acetone has been suggested.

It contains free Cinnamic Acid, α and β Storesinol, Styrol and Styracin (Cinnamyl Cinnamate).

Medicinal Properties.—Similar in action to the Balsams of Peru and Tolu. The Ointment (1 to 4) is useful as a parasiticide in scabies and phtheiriasis.

Official Preparation.—Contained in Tinctura Benzoini Composita.

Not Official.—Unguentum Stryracis Compositum, Pommade de Styrax.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Descriptive Notes.—Liquid Storax as imported consists of an opaque greyish viscid liquid, containing about 10 to 20 p.c. of Water, which settles to a certain extent at the bottom of the containing vessel. It is only after purification by solution in Alcohol, filtration and evaporation of the Alcohol, that it presents the appearance required by the *B.P.*, viz., a semi-transparent, brownish-yellow, semi-liquid balsam. It has a strong odour resembling Hyacinth and a balsamic taste. The product of a North American species, *Liquidambar styraciflua*, Linn., is sometimes imported from Guatemala and Nicaragua. It is transparent, of a golden-brown colour, and of the consistence of thick clarified Honey. In Europe it is chiefly used in perfumery; in the United States it is known as Sweet Gum and is used in the preparation of Chewing Gum.

Occasionally the bark of *Liquidambar orientalis*, Mill., from which the Storax has been expressed, is imported under the name of Storax bark, and is utilised in the preparation of fumigating pastilles and incense. The substance sold as Styrax Calamita usually consists of sawdust impregnated with liquid Storax or, more rarely, of the powdered Storax bark 3 parts beaten with Storax 2 parts to cause it to form a mass.

Tests.—Storax, according to the *B.P.*, when heated in a test-tube placed in boiling Water becomes more liquid but gives off no moisture. According to Dieterich a limit of moisture might have been introduced into the *B.P.*, and he suggests 15 p.c. as a suitable limit, his former limit of 8 p.c. being deemed too high. When boiled with Potassium Bichromate and Sulphuric Acid an odour of Benzaldehyde (Essential Oil of Bitter Almonds) is evolved. A limit for matter soluble or insoluble in Alcohol might have been included in the *B.P.* The *U.S.P.* requires that it shall contain not less than 60 p.c. of its weight of matter soluble in Alcohol (94·9 p.c.); the alcoholic residue being required to be almost completely soluble in Ether and Carbon Bisulphide, but partially soluble in Petroleum Benzin. The *P.G.* requires that when 100 parts of Storax are completely exhausted with boiling Alcohol (90 p.c.) the residue which remains shall amount at the highest to 2·5 p.c. by weight. The *P.G.* requires that when mixed with an equal weight of Alcohol (90 p.c.) it shall form a greyish-brown, cloudy liquid with an acid reaction, which, after filtering and evaporating down, leaves a transparent, semi-fluid brown mass, consisting of at least 65 p.c. by weight of the original Storax, which residue shall be soluble in Ether, Carbon Bisulphide, and Benzol, but not in Petroleum Benzin. Storax leaves 0·01 to 0·5 p.c. of ash. Useful constants are the Acid and Ester value and the proportion of Cinnamic Acid, but these are not at present included in the *B.P.*, though it has been recommended that they should be stated. The Acid value varies between 70 to 90, the Ester value from 50 to 120. The *U.S.P.* states that Storax when heated in a water-bath becomes more fluid, and when agitated with warm Petroleum Benzin the supernatant liquid, on being decanted and allowed to cool, will deposit white crystals of Cinnamic Acid and Cinnamic esters. Agitation with Petroleum Ether has been suggested (*Y.B.P.* '01, 116) as a means of detecting Resin as an adulterant. A weighed portion of the Storax mixed with coarse sand is exhausted with Petroleum Ether, the solution filtered, the solvent removed by distillation, and the Saponification value of the residue determined. The Acid value should vary from 40 to 55 and the Saponification value from 180 to 197. Specimens containing Resin as an adulterant may possess an Acid value as high as 116 to 121, and a total Saponification value as low as 172 to 178.

Not Official.

UNGUENTUM STYRACIS COMPOSITUM.—Oleum Officinale 25, Yellow Wax 15, Liquid Storax 15, Elemi 15, Venetian Turpentine 30.—*Belg.*

POMMADE DE STYRAX.—Storax 16, Colophony 29, Elemi 16, Yellow Wax 16, Olive Oil 23.—*Fr.*

SUCCI.

JUICES.

Juices expressed from fresh medicinal plants, and preserved by the addition of Alcohol, were introduced by Peter Squire in 1835 (*P.J.* vol. i.). By thus obtaining and preserving the juice of the plant, its properties are not impaired by the action of the heat employed in making an Extract.

Succus Belladonnæ, Succus Conii, Succus Hyoscyami, Succus Scoparii, and Succus Taraxaci, consist of 3 parts of Juice and 1 of Alcohol (90 p.c.).

Succus Limonis is freshly expressed and contains no Alcohol.

The **Alcoolatures** of the Fr. are made by digesting equal weights of fresh plant and Rectified Spirit together for 8 or 10 days; pressing and filtering. Aconite, Belladonna, Conium (Ciguë), Digitalis, Eucalyptus, Henbane (Jusquiame), Stramonium Leaves, Flowers, and Corms of Colchicum, are so prepared.

Not Official.

SUCCINUM.

AMBER.

Translucent or opaque, hard brittle, yellow, yellowish-brown or yellowish-red solid, breaking with lustrous conchoidal fracture.

A fossil resinous exudation from *Pinites succinifer*, Gœppert, an extinct coniferous tree, on the shores of the Baltic.

Foreign Pharmacopœias.—Official in Dutch, Mex. (Ambar Amarillo), Port. (Ambar), and Swed.

OLEUM SUCCINI RECT.—A transparent, pale yellow or brownish-yellow limpid oily liquid, possessing a characteristic disagreeable odour and burning acrid taste. It is a volatile Oil obtained by the destructive distillation of Amber, and purified by subsequent rectification.

A cheaper and inferior product is sold under the name of Ol. Succini, which forms a fractional portion of resin spirit obtained by the distillation of ordinary resin.—*P.J.* (4), viii., p. 98.

Externally it is stimulant and rubefacient.

Dose.—1 to 3 minims = 0·06 to 0·18 c.c.

Foreign Pharmacopœias.—Official in Hung., Mex., Norw. and Port.

Tests.—Rectified Oil of Amber has a sp. gr. of about 0·905. It boils between 170° and 186° C. (338° and 366·8° F.). It has a characteristic unpleasant odour, and a hot acrid taste. It is soluble in all proportions of Ether, Chloroform and Carbon Bisulphide.

LINIMENTUM SUCCINI.—Oil of Amber, 1; Spirit of Camphor, 1; Spirit of Hartshorn, 1.

A domestic **embrocation** for whooping-cough.

LINIMENTUM SUCCINI COMPOSITUM.—Oil of Amber, ½; Oil of Cloves, ½; Olive Oil, 1.—This formula is given in *Pharm. Form.* as a traditional imitation of Roche's Embrocation, and is now incorporated in the *B.P.C.*

TINCTURA SUCCINI.—Amber, 1; Alcohol (90 p.c.), 16.

Dose.—25 minims = 1·5 c.c. in Water for headache.

Foreign Pharmacopœias.—Official in Dutch, 1 Amber and 5; Port., 2·8 Oil in 10; Swed., 1 Amber in 5.

SULPHONAL.

SULPHONAL.

SULPHONMETHANUM, SULPHONMETHANE.

$C_7H_{16}S_2O_4$, eq. 226·53.

FR., DIÉTHYLSULFONE-DIMÉTHYLMÉTHANE; GER., SULFONAL;
ITAL., SOLFONALE; SPAN., SULFONAL.

Colourless, odourless, almost tasteless, prismatic crystals; or a white odourless crystalline powder. Permanent in the air.

The *B.P.* describes Sulphonal as Dimethyl-methane-diethylsulphone, a product of the oxidation of Mercaptol obtained from Acetone and Mercaptan. The *U.S.P.* describes it as Diethylsulphonedimethylmethane, a product of the condensation of Acetone with Ethylmercaptan. The *P.G.* does not state its origin.

It should be kept in well-stoppered glass bottles.

It belongs to the class of Di-sulphones to which Trional and Tetronal also belong.

It is officially required to be in crystals, but it is generally supplied in *powder*; its action is stated to be quicker and more certain in that form than when administered in crystals.

Solubility.—1 in 500 of Water; 1 in 15 of boiling Water; 1 in 50 of Alcohol (90 p.c.); 1 in 3 of Chloroform; 1 in 90 of Ether.

Medicinal Properties.—A pure hypnotic for simple insomnia, when pain is absent. As in repeated doses it may be cumulative, and produce hæmatoporphyrinuria and other toxic effects, it is not the hypnotic to select for continued use. It is more soluble in warm than in cold Water, and still more so in warm alcoholic drinks, the latter being the best way of administration. If taken in the form of a powder or tablet, the action may, owing to comparative insolubility, be deferred for 1 or 2 hours, but if taken in hot solution the action is far more rapid.

Toxic effects following the administration of 35 grains given in divided doses of 20 and 15 grains at an interval of 24 hours. Recovery.—*B.M.J.* '99, i. 209.

A case in which a quantity of 300 grains was taken in 2 doses of 150 grains; only slight drowsiness supervening owing to prompt action of emetics.—*B.M.J.* '00, i. 136.

Toxic cumulative effect of Sulphonal and Trional. The only treatment of any avail for Sulphonal poisoning is the free exhibition of alkalis; when there is vomiting and great difficulty in getting the alkali taken in sufficient quantity the intravenous or interstitial transfusion of an alkaline solution might be tried.—*B.M.J.* '92, ii. 1250.

A fatal case of hæmatoporphyrinuria following its use, also a record of another fatal case in which only 30 grains had been taken in 2 doses.—*B.M.J.* '01, i. 1473; *T.G.* '01, 618.

Valuable in early cases of insanity, but in ordinary acute insanity, with extreme restlessness and sleeplessness, Sulphonal even in moderate doses was injurious. The prolonged use of Sulphonal was pernicious from the point of view of auto-intoxication.—*L.* 02, i. 1539.

May be tried for the sleeplessness of uræmic patients; the dose should not be large.—*Pr.* lxvii. 658.

A serious feature in most of the fatal cases of poisoning is that usually the patients have been under treatment for some time and have been apparently benefited by the drug up to the time of the appearance of toxic symptoms.—*L.* '03, i. 1023; *B.M.J.* '03, i. 853.

The urine of patients taking Sulphonal is stated to reduce Fehling's Solution.—*B.M.J.E.* '95, ii. 43; *P.J.* (3) xxv. 1124.

Of the Sulphur hypnotics, Sulphonal was uncertain in its action and caused tissue changes as evidenced by hæmatoporphyrinuria.—*B.M.J.* '05. ii. 250.

Dose.—10 to 30 grains = 0·65 to 2 grammes.

Prescribing Notes.—*It is given in* **mixtures** *suspended with Compound Tragacanth Powder* 60 *grains to* 6 *fl. oz. of Water. Also in* **cachets, capsules,** *Compressed Tablets, or in* **powders,** *to be taken perhaps best of all in hot Water, or hot Spirits and Water.*

Not Official.—Trional and Tetronal.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr. (Diethylsulfone-diméthylméthane), Ger., Ital. (Solfonale), Jap., Mex., Norw., Russ., Span., Swed., Swiss and U.S. (Sulphonmethanum).

Tests.—Commercial Sulphonal melts at 125·07° C. (257·13° F.), dried Sulphonal at 125·24° C. (257·43° F.), purified Sulphonal at

125·26° C. (257·47° F.). The *B.P.* m.p. is 125·5° C. (258° F.), this figure is also given in the *U.S.P.* The *P.G.* states 125° to 126° C. (257° to 258·8° F.). At a higher temperature it burns away, emitting an odour of Sulphur Dioxide. When a small quantity is heated with a little powdered Charcoal in a dry tube, or when a mixture of equal weights of Sulphonal and Potassium Cyanide are heated, the characteristic and disagreeable odour of Mercaptan is evolved; if the residue from the latter be dissolved in Water, an excess of Hydrochloric Acid added it yields on the addition of a few drops of Ferric Chloride T.S. a reddish colour. When gradually warmed with dried Sodium Acetate it evolves Hydrogen Sulphide. The saturated aqueous solution should be neutral in reaction towards Litmus paper.

The more generally occurring impurities are Chlorides and Sulphates, readily oxidisable organic impurities, Mercaptan or Mercaptol and mineral impurities. The saturated aqueous solution should yield no turbidity upon the addition of Silver Nitrate Solution or Barium Chloride Solution, indicating the absence of Chlorides and Sulphates. Readily oxidisable organic impurities may be detected by the test with Potassium Permanganate given in the small type below. The substance should leave no weighable residue when heated with free access of air, indicating the absence of mineral impurity, and the solution in boiling Water should be free from odour, indicating the absence of Mercaptan and Mercaptol.

Potassium Permanganate.—If 1 drop of Potassium Permanganate be added to an aqueous solution (to 10 c.c. of an aqueous solution 1–50, *P.G.*), the liquid should not be immediately decolorised, *P.G.* and *U.S.P.*

Not Official.

TRIONAL, Methyl-Sulphonal, Sulphonethylmethanum, Sulphonethylmethane ($C_8H_{18}S_2O_4$, eq. 240·44).—A white crystalline powder with a faintly bitter taste. Is analogous in composition to Sulphonal, but with a Methyl group replaced by Ethyl.

The *U.S.P.* describes Trional under the heading of Sulphonethylmethanum as Diethylsulphonemethylethylmethane, a product of the oxidation of the Mercaptol obtained by the condensation of Methylethylketone with Ethyl Mercaptan.

It should be kept in well-stoppered glass bottles.

It is not official in the *B.P.*

Solubility.—1 in 320 of Water; 1 in 11 of Alcohol (45 p.c.).

Medicinal Properties.—A pure hypnotic like Sulphonal, but, being more soluble, acts more rapidly. Useful in melancholia, mania, and in many nervous affections, in delirium tremens, in sleeplessness of children; it may induce constipation.

In the insomnia of tricuspid incompetency 10 grains given at bedtime yield successful results.—*M.P.* '04, ii. 515. It requires watching, as cases of artificial nephritis are recorded.

Poisonous effects not produced if used cautiously.—*B.M.J.E.* '96, i. 27.

In insomnia and delirium due to alcoholism and nicotinism, 10 to 30 grains given at first; after a few trials 15 grains every 4 hours and up to 90 grains per diem were given.—*L.* '01, ii. 223.

5 to 10 grains thrice daily in chorea.—*B.M.J.* '01, ii. 1805; '02, i. 267.

15 grains every other night for 15 weeks produced toxic symptoms.—*L.* '03, i. 1023; *B.M.J.* '03, i. 853.

Acute poisoning caused by taking 25 5-grain tablets in 1 dose. Recovery.—*L.* '03, i. 1096.

Dose.—For children, 5 to 10 grains = 0·32 to 0·65 gramme; for adults, 15 to 30 grains = 1 to 2 grammes, usually given in cachets followed by a hot drink, or suspended with Tragacanth like Sulphonal.

Ph. Ger. maximum single dose, 2 grammes; maximum daily dose, 4 grammes.

Foreign Pharmacopœias.—Official in Austr. and Span. (Trional); Belg., Dutch, Ger., Jap. (Methylsulfonalum); Fr. (Diéthylsulfoneéthylméthylméthane); Swiss, Diäthylsulfonmethyläthylmethanum; U.S. (Sulphonethylmethanum).

Tests.—Trional melts at 76·5° C. (169·7° F.). The *U.S.P.* and the *P.G.* give 76° C. (168·8° F.). At a red heat it evolves an odour of Sulphur Dioxide. When heated with an equal quantity of powdered Charcoal in a dry test-tube it evolves the characteristic disagreeable odour of Mercaptan, and when gradually heated with dried Sodium Acetate it emits a characteristic and disagreeable odour of Hydrogen Sulphide. In the directions for performing this test in the case of Sulphonal, the *U.S.P.* directs the use of dry Sodium Acetate, whilst, in the case of Trional, the use of dried Sodium Acetate is directed.

The more generally occurring impurities are Chlorides and Sulphates, readily oxidisable organic impurities, Mercaptan or Mercaptol and mineral impurities. The saturated aqueous solution should not afford a turbidity with Silver Nitrate Solution or with Barium Chloride Solution, indicating the absence of Chlorides and Sulphates. It should not decolorise 1 drop of a 1 in 1000 Potassium Permanganate Solution, indicating the absence of readily oxidisable organic impurities. 1 gramme dissolved in 50 c.c. of boiling Water should evolve no odour, indicating the absence of Mercaptan and Mercaptol. When ignited with free access of air it should leave no weighable residue, indicating the absence of mineral impurities.

TETRONAL (Diethylsulphon-diethylmethane).—It is analogous in composition to Sulphonal, but with 2 Methyl groups replaced by Ethyl. A white crystalline odourless powder. Soluble 1 in 550 of Water; 1 in 12 of Alcohol (90 p.c.).

It is a hypnotic resembling Sulphonal.

Dose.—10 to 20 grains = 0·65 to 1·3 gramme.

Tests.—Tetronal melts at 85° C. (185° F.). It is but sparingly soluble in Water, but dissolves in Alcohol, forming a solution which is neutral in reaction towards Litmus paper. When heated with an equal weight of powdered Charcoal in a test-tube it evolves the characteristic and unpleasant odour of Mercaptan. When gradually heated with dry Sodium Acetate it evolves the characteristic unpleasant odour of Hydrogen Sulphide. When boiled with 50 times its own weight of Water no unpleasant odour should be developed, indicating the absence of Mercaptan and Mercaptol. The saturated aqueous solution should yield no turbidity on the addition of Silver Nitrate Solution, or on the addition of Barium Chloride Solution, indicating the absence of Chlorides and Sulphates, nor should it immediately decolorise. 1 drop of a 1 in 1000 Potassium Permanganate Solution, indicating the absence of readily oxidisable organic impurities.

Not Official.

SULPHUR.

SULPHUR.

S, eq. 31·82.

Sulphur occurs native, and is found in masses or in the powdery form mixed with various impurities. It is abundant in volcanic countries, as in Sicily, and in some parts of Italy. It readily volatilises, and when the vapours are passed into a large brick chamber kept cold, it condenses in fine powder (Sublimed Sulphur), and when a small chamber is used and kept at a temperature of about 120° C. (248° F.), it condenses in the liquid form and is run into moulds (Roll Sulphur).

Foreign Pharmacopœias.—Official in Belg., Sulphur; Ital. (Solfo); Port. (Enxofre); Mex. and Span., Azufre; Swed.

SULPHUR PRÆCIPITATUM.

PRECIPITATED SULPHUR.

B.P.Syn.—MILK OF SULPHUR.

A light-grey, or greyish-yellow, smooth, amorphous powder, sometimes possessing a slight odour of Hydrogen Sulphide.

It is prepared by precipitating the Sulphur from solution of Calcium Sulphide and Thiosulphate by means of Hydrochloric Acid; the former solution is prepared by boiling Sulphur with Lime.

LAC SULPHURIS of former Pharmacopœias contained a large amount of Calcium Sulphate, owing to Sulphuric Acid being used in its preparation, but as Hydrochloric Acid is now employed, no distinction should be made between Milk of Sulphur and Precipitated Sulphur.

Medicinal Properties.—Similar to those of Sulphur Sublimatum, only more active. Mixed with Milk and rubbed till smooth, children take it readily.

Dose.—20 to 60 grains = 1·3 to 4 grammes.

Official Preparation.—Trochiscus Sulphuris.

Not Official.—Lotio Sulphuris, Trochiscus Sulphuris Compositus, Pastillus Sulphuris Compositus, Sulphur Hair Lotion, Lotio Plumbi et Sulphuris, Unguentum Sulphuris Præcipitati, Unguentum Sulphuris Camphoratum, and Unguentum Sulphuris et Resorcini.

Foreign Pharmacopœias.—Official in Fr. (Soufre Précipité); Ital. (Solfo Precipitato); Port. (Enxofre Precipitado); Mex. and Span. (Azufre Precipitado).

Tests.—Precipitated Sulphur melts at 115° C. (239° F.). It should be readily and completely soluble in Carbon Bisulphide. When ignited it burns with a blue flame, emitting a penetrating distinctive odour of Sulphur Dioxide. When evaporated to dryness with Nitric Acid the residue dissolved in Water and the solution filtered, it yields on the addition of Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid. The *B.P.* requires that under the microscope it shall consist of opaque globules without crystalline matter. The *U.S.P.* requires that it shall contain not less than 99·5 p.c. of pure Sulphur, but does not indicate a method of determination. Neither the *B.P.* nor the *P.G.* gives the percentage required.

The more generally occurring impurities are acid or alkali, Arsenic, Calcium, Chlorides, Sulphates and mineral impurity. The presence of acid or alkali may be detected by the reaction with Litmus given in small type below. Arsenic may be detected by the Hydrogen Sulphide test described below. If a portion of the specimen be shaken with Water acidified with Nitric Acid and filtered, the filtrate should yield only the faintest turbidity with Silver Nitrate Solution, indicating the absence of more than traces of Chlorides; neither should it yield a turbidity with Ammonium Oxalate Solution. When ignited with free access of air it should leave no weighable residue.

Litmus.—If 5 c.c. of Water be agitated with 2 grammes of Precipitated Sulphur, the liquid should not change the colour of blue or red Litmus paper, *U.S.P.*; moistened with Water, it should not redden blue Litmus paper, *P.G.*

Hydrogen Sulphide.—Precipitated Sulphur allowed to stand with 20 parts of Ammonia T.S. at 35° to 40° C. (95° to 104° F.), with intervals of occasional shaking, gives a filtrate which should not be coloured yellow when acidulated with Hydrochloric Acid or on the subsequent addition of T.S. of Hydrogen Sulphide, *P.G.* If 1 gramme be digested for several hours with 10 c.c. of Ammonia Water and the liquid filtered, one half of the clear filtrate should not leave a residue on evaporation; if the remainder be evaporated to dryness on a water-bath, then after adding 1 c.c. of Nitric Acid and again evaporating, the solution obtained by dissolving the residue in 10 c.c. of Hydrochloric Acid (8 p.c.) should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Preparation.

TROCHISCUS SULPHURIS. SULPHUR LOZENGE.

Contains 5 grains of Precipitated Sulphur, and 1 grain Acid Potassium Tartrate in each, flavoured with Tincture of Orange.

Dose.—1 to 6 lozenges.

Belg. has Sulphuris Tabellæ, 0·1 gramme = 1½ grains in each; Fr. has Tablettes de Soufre, 0·1 gramme = 1½ grains in each; Mex. has Pastillas de Azufre, 0·1 gramme = 1½ grains in each.

Not Official.

LOTIO SULPHURIS.—Precipitated Sulphur, ½ oz.; Glycerin, 120 minims; Alcohol (90 p.c.), 1 fl. oz.; Rose Water, 3 fl. oz.; Lime Water, 3 fl. oz. Recommended in acne of the face.—*L.* '87, i. 66.

This has been incorporated in the *B.P.C.* as follows:—Precipitated Sulphur, 6; Glycerin, 3; Alcohol, 12·50; Rose Water, 40; Lime Water, *q.s.* to produce 100.

TROCHISCUS SULPHURIS COMPOSITUS.—Each lozenge contains 5 grains of Precipitated Sulphur, and 1 grain of Cream of Tartar.

These lozenges differ from the official Sulphur lozenge in that they contain no Orange, and are therefore preferred by many.

A convenient form of administering Sulphur as a general laxative, in cases of sluggish liver, bleeding piles, and habitual constipation.—*L.* '89, i. 665.

PASTILLUS SULPHURIS COMPOSITUS.—Precipitated Sulphur, 5 grains; Acid Potassium Tartrate, 1 grain.—*Martindale* and *B.P.C.*

SULPHUR HAIR LOTION.—Acetate of Lead, 1½ drm.; Milk of Sulphur, (Calcareous), 3 drm.; Glycerin, 10 drm.; Heliotrope Perfume, 2 drm.; Water, to 10 oz.—*Pharm. Form.*

Lotio Plumbi et Sulphuris. *Syn.* Sulphur Hair Restorer.—Lead Acetate, 1·75; Precipitated Sulphur, 3·50; Glycerin, 12·50; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

UNGUENTUM SULPHURIS CAMPHORATUM.—Precipitated Sulphur, 10 grains; Carbolic Acid, 15 grains; Resorcin, 15 grains; Camphor, 15 grains; Solution of Coal Tar, 25 minims; Benzoated Lard, 240 grains; Soft Paraffin, white, 240 grains.—*St. Mary's.*

This has been incorporated in the *B.P.C.*

UNGUENTUM SULPHURIS ET RESORCINI.—Precipitated Sulphur, 20 grains; Resorcin, 15 grains; Soft Paraffin, yellow, to 1 oz.—*St. Thomas's.*

This has been incorporated in the *B.P.C.* as follows:—Precipitated Sulphur, 4·50; Resorcin, 3; Soft Paraffin, yellow, to produce 100.

UNGUENTUM SULPHURIS PRÆCIPITATI.—Precipitated Sulphur, 2; Potassium Carbonate, 1; Lard, 8. Excellent for scabies.

SULPHUR SUBLIMATUM.

SUBLIMED SULPHUR.

B.P.Syn.—FLOWERS OF SULPHUR.

A bright yellow or greenish-yellow amorphous powder, possessing a faint characteristic odour.

It may be prepared from native Sulphur or Sulphides.

Solubility.—Insoluble in Water. Slightly soluble in hot Alcohol. Only partially soluble in Carbon Bisulphide.

Medicinal Properties.—Laxative, alterative, diaphoretic, expectorant. Employed internally in hæmorrhoids and chronic rheumatism, hepatic congestion, gout, chronic bronchitis and many skin diseases; externally also for skin diseases, especially scabies and acne.

Dusted on the membrane in diphtheria.—*B.M.J.* '93, ii. 993; '94, i. 459; *L.* '95, i. 265, 327. 20 grains with or without 5 grains of Dover's Powder 3 times daily in dysentery.—*L.* '01, ii. 1406.

In typhoid fever, 20 grains every 2 hours up to 154 grains in the day for adults, for children 5 to 7½ grains every 2 hours up to 60 grains in the day.—*B.M.J.E.* '02, ii. 83.

Dose.—20 to 60 grains = 1·3 to 4 grammes.

Official Preparations.—Confectio Sulphuris and Unguentum Sulphuris; contained in Pulvis Glycyrrhizæ Compositus. Used in the preparation of Acidum Sulphuricum, Acidum Sulphurosum, Emplastrum Ammoniaci cum Hydrargyro, Emplastrum Hydrargyri, Antimonium Sulphuratum, Potassa Sulphurata, Sulphur Præcipitatum and Sulphuris Iodidum.

Not Official.—'Chelsea Pensioner,' Unguentum Sulphuris Compositum, Vasolimentum Sulphuris, Vasolimentum Sulphuris Compositum, Parogenum Sulphuris, Parogenum Sulphuris Compositum.

Foreign Pharmacopœias.—Official in all. Austr. (Sulphur Depuratum); Belg. (Sulphur Lotum); Dan. (Sulphur Sublimatum), also Sulphur Sublimatum Venale; Dutch, Ger., Jap. and Russ. (Sulphur Sublimatum, also Sulphur Depuratum); Fr. (Soufre Sublimé and Soufre Sublimé Lavé); Hung. (Sulphur Sublimatum, also Sulphur Sublimatum Lotum); Ital. (Solfo Sublimato, also Solfo Sublimato e Lavato); Mex. (Azufre Sublimado y Lavado); Norw. (Sulphur Sublimatum); Port. (Enxofre Sublimado, also Enxofre Lavado); Span. (Azufre Sublimado, also Azufre Lavado); Swed. (Sulphur Sublimatum, also Sulphur Sublimatum Elotum); Swiss (Sulphur Sublimatum Crudum, also Sulphur Lotum); U.S. (Sulphur Sublimatum, also Sulphur Lotum).

Tests.—Sublimed Sulphur melts at about 115° C. (239° F.). When ignited it burns with a blue flame, evolving a distinctive penetrating odour of Sulphur Dioxide, which blackens a strip of paper moistened with Mercurous Nitrate Solution. When oxidised with Nitric Acid, the residue dissolved in Water yields, with Barium Chloride Solution, a dense white precipitate insoluble in Hydrochloric Acid. It is officially required to consist of almost opaque, irregular particles, and to be free from admixture of crystalline matter when examined under the microscope. The *U.S.P.* requires that it shall contain not less than 99 p.c. of pure Sulphur, but does not indicate a method for its determination. Neither the *B.P.* nor *P.G.* states the requisite percentage nor a method of determination.

The more generally occurring impurities are acid or alkali, Arsenic and mineral matter. If the specimen be shaken with Water and filtered, the filtrate should possess neither an acid nor an alkaline reaction towards Litmus paper, indicating the absence of acid or alkali. The *B.P.* test of freedom from acidity can only be expected from washed Sulphur, which is official in most Foreign Pharmacopœias. Commercial Sublimed Sulphur is always more or less acid. Sublimed Sulphur always gives an acid reaction unless freshly washed and dried. When shaken with Ammonia Solution and filtered, the filtrate should not, on acidification with Hydrochloric Acid, afford a yellow precipitate or turbidity, nor should another portion yield a residue when evaporated to dryness, indicating the absence of Arsenic Sulphide. The residue left in this Ammonia test might be Ammonium Sulphate, and is no proof of the presence of Arsenic or Arsenic Sulphide. The Arsenic test is not delicate enough. A standard has been suggested (*C.D.* '08, i. 796) of 2 parts per million for Arsenic. When ignited with free access of air Sulphur should burn leaving no weighable residue.

Preparations.

CONFECTIO SULPHURIS. Confection of Sulphur.

Sublimed Sulphur, 4 oz.; Acid Potassium Tartrate, 1 oz.; Tragacanth, in powder, 18 grains; Syrup, 2 fl. oz.; Tincture of Orange, ½ fl. oz.; Glycerin, 1½ fl. oz. (1 in 2¼)

Now made with Glycerin, Syrup, and Tincture of Orange in place of Syrup of Orange Peel.

Dose.—60 to 120 grains = 4 to 8 grammes.

UNGUENTUM SULPHURIS. Sulphur Ointment.

Sublimed Sulphur, finely sifted, 1; Benzoated Lard, 9. (1 in 10)

In *B.P.* '85 it was 1 in 5.

Precipitated Sulphur makes a more active Ointment, and Essence of Lemon covers the odour.

An **ointment** ¼ of *B.P.* '85 strength exerts a destructive effect on the ringworm fungus.—*B.M.J.* '89, i. 398.

Foreign Pharmacopœias.—Official in Belg. (Sulphuris Alcalini Unguentum), Potassium Carbonate 10, Water 5, Sulphur 20, Lard 65; Jap. and Russ., Sulphur 1, Lard 2; Fr., Sulphur 1, Almond Oil 1, Benzoinated Lard 8; Mex., Sulphur 1, Benzoinated Lard 3; Port. and Swiss., Sulphur 3, Lard 7; Port. has also compound ointment 1 in 5; Russ. has also compound ointment 1 in 10; Span., Sulphur 1, Lard 4; U.S., Sulphur 3, Benzoinated Lard 17.

Not Official.

'CHELSEA PENSIONER.'—Sulphur, 6; Mustard, 6; Powdered Guaiacum, 3; Rhubarb, 1½; Nitre, 1½; mix. Honey or Treacle sufficient to make it into an Electuary.

Dose.—A teaspoonful every alternate night for rheumatism; it is also taken in the morning as an aperient to regulate the bowels.

See also GUAIACUM, p. 583.

UNGUENTUM SULPHURIS COMPOSITUM. *Syn.* UNG. AD SCABIEM VIENNENSE. WILKINSON'S OINTMENT.

Sulphur, 15; Chalk, 10; Tar, 15; Lard, 30; Soap, 30.

This has been incorporated in the *B.P.C.*

Foreign Pharmacopœias.—Official in Austr., Sulphur 16, Chalk 4, Tar 16, Lard 16, Mutton Suet 16, Potash Soap 32; Dutch, Sulphur 15, Pulvis Marmoris 20, Yellow Vaseline 30, Potash Soap 20, Oil of Cade 15; Hung., Sulphur 15, Chalk 10, Potash Soap 30, Lard 20, Yellow Wax 10, Tar 15; Norw. and Swed., Sulphur 15, Chalk 10, Tar 15, Lard 30, Soap 30; Swiss, Sulphur 10, Zinc Sulphur 10, Soap 15, Lard 65.

UNGUENTUM SULPHURIS COMPOSITUM.—Sulphur, 4 oz.; Powdered White Hellebore, 10 drm.; Nitrate of Potash, 2 scruples; Soft Soap, 4 oz.; Lard, 12 oz.; all by troy weight.—*P.L.* 1851.

VASOLIMENTUM SULPHURIS.—Sublimed Sulphur, 3; Linseed Oil, 37; Simple Vasoliment, *q.s.* to make 100. Heat the Sulphur and Linseed Oil together until dissolved, and make up with Simple Vasoliment.—*Y.B.P.* '01, 212.

Parogenum Sulphuris. *Syn.* Sulphur Vasoliment.—Sublimed Sulphur' 3; Linseed Oil, 37; Parogen, *q.s.* to produce 100.—*B.P.C.*

VASOLIMENTUM SULPHURIS COMPOSITUM.—Sulphur Vasoliment, 10; Cade Oil, 10; Thymol, 0·3; Eucalyptol, 3; Turpentine, 30; and make up with Vasoliment to 100.—*Y.B.P.* '01, 212.

Parogenum Sulphuris Compositum. *Syn.* Compound Sulphur Vasoliment.—Sulphur Parogen, 10; Oil of Cade, 10; Thymol, 0·3; Eucalyptol, 3; Oil of Turpentine, 30; Parogen, *q.s.* to produce 100.—*B.P.C.*

Not Official.

SULPHURIS CHLORIDUM.

SULPHUR CHLORIDE.

S_2Cl_2, eq. 134·02.

A mobile reddish-yellow liquid, sp. gr. 1·69, with a penetrating disagreeable odour, and fuming strongly in air. Prepared by the direct union of Chlorine with Sulphur. It dissolves without decomposition in Carbon Bisulphide or Benzol, but is decomposed by Water, Alcohol or Ether.

UNGUENTUM SULPHURIS HYPOCHLORITIS.—Sublimed Sulphur, 1 oz.; Sulphur Chloride, 1 fl. drm.; Spermaceti Ointment (*B.P.* 1867), 8 oz.; Essential Oil of Almonds, 80 minims, is usually added to mask the disagreeable odour.

Used in the treatment of scabies and acne.

Occasionally made of twice this strength.

Sublimed Sulphur, 12; Sulphur Chloride, 2; Essential Oil of Almonds, by weight, 2; Lard, 84.—*B.P.C.*

SULPHURIS IODIDUM.

SULPHUR IODIDE.

Greyish-black crystalline masses, possessing a metallic lustre and evolving a strong odour of Iodine. It should be kept in well-stoppered bottles in a cool place. Like Iodine, it stains the skin. It is prepared by direct combination of Iodine and Sulphur by heating them together.

The proportions of Iodine and Sulphur are used in equivalents to form SI, eq. 157·72, but the combination is a very loose one.

Solubility.—1 in 16 of Glycerin; 1 in 4 of Carbon Bisulphide. Insoluble in cold Water.

Medicinal Properties.—The Ointment is an excellent remedy for acne rosacea, and for parasitic, tubercular and other diseases of the skin.

Official Preparation.—Unguentum Sulphuris Iodidi.

Foreign Pharmacopœias.—Official in Mex. (Yoduro de Azufre); Port. (Enxofre Iodado); U.S. (Sulphuris Iodidum).

Tests.—Sulphur Iodide when exposed to the air gradually loses Iodine. When heated the Iodine sublimes first. When boiled with Water the Iodine passes off in vapour, the Sulphur remaining as an insoluble residue. The amount of this residue is officially required to be about one-fifth of the weight of the original Sulphur Iodide. The *U.S.P.* states that continued boiling with Water vaporises all the Iodide, leaving about 20 p.c. of Sulphur as a residue. It is completely soluble in Carbon Bisulphide. No requisite percentage of pure Sulphur Iodide is mentioned in the *B.P.*, but a rough method of determination is given based upon the insoluble residue remaining when the Sulphur Iodide is boiled with Water, which is officially required to amount to about one-fifth of the weight of the sample taken. Solution in Potassium Iodide and titration with Sodium Thiosulphate would be a better test for quality than the determination of residual Sulphur. The *U.S.P.* requires that it shall contain not less than 70·5 p.c. of Iodine as volumetrically determined by dissolving a mixture of 0·5 of a gramme of the finely-powdered Sulphur Iodide and 1 gramme of Potassium Iodide in 20 c.c. of Water and titrating with Tenth-normal Volumetric Sodium Thiosulphate Solution, using Starch Mucilage as an indicator, not less than 28 c.c. should be required; 1 c.c. of Tenth-normal Volumetric Sodium Thiosulphate corresponds to 0·01259 gramme of Iodine. This percentage of Iodine corresponds to about 88·3 p.c. of Sulphur Iodide of the formula given above.

Preparation.

UNGUENTUM SULPHURIS IODIDI. SULPHUR IODIDE OINTMENT.

Rub 20 grains of Sulphur Iodide with 20 grains of Glycerin to a smooth paste in a warmed mortar, and gradually add 460 grains of Benzoated Lard, and stir until cold.

B.P. (1898) reduced the strength from 1 in 15½ to 1 in 25. Glycerin was added and Benzoated Lard replaced Hard and Soft Paraffin.

It is apt to be gritty unless carefully made; it becomes darker on keeping.

SUMBUL RADIX.

SUMBUL ROOT.

The dried transverse slices of the Root of *Ferula Sumbul.*

Imported from Russia. It possesses a powerful odour resembling Musk. An inferior kind has of late years replaced the old Sumbul root.

Medicinal Properties.—Carminative and antispasmodic, said to be useful in hysteria and allied nervous complaints.

Official Preparation.—Tinctura Sumbul.

Foreign Pharmacopœias.—Official in Mex.; Port. (Sombula); U.S. has Extract and Fluid Extract.

Descriptive Notes.—The Sumbul Root of commerce is probably not that of the official species, *Ferula Sumbul*, Hook. f., which apparently has not been collected for many years (an undetermined species, *U.S.P.*). The segments of the root of Ferula Sumbul are 3 to 4 in. (75 to 100 mm.) in diameter, 1½ to 2 in. (37 to 50 mm.) in thickness (1 to 3 in. (25 to 75 mm.) in diameter, ¾ to 1 in. (18 to 25 mm.) or more in thickness *B.P.*). Externally the bark is papery, pale brown, annulated in the upper or rootstock portion and sometimes bristly with the remains of the leaf-stalks near the apex. The transverse section is spongy and fibrous, and shows an irregular, somewhat contorted arrangement of the vascular tissue, and owing to the exudation of oleoresin it is usually marbled with blackish patches. The root yields about 9 p.c. of soft resin and ⅓ p.c. of a dingy, bluish, essential oil. It has a bitter and musky taste and a musky odour. The article at present in commerce is probably the root of *Ferula suaveolens*, This has quite a weak musky odour and occurs in smaller pieces, although in general appearance resembling the official kind. Occasionally there has appeared a false Sumbul in commerce, the Indian Sumbul of Pereira, which consists of the root of *Dorema Ammoniacum*, scented with tincture of Musk; it closely resembles Sumbul in appearance, but when kept in a bottle or closed vessel the odour of Ammoniacum soon overcomes that of the Musk and is easily recognised; the characteristic taste of Ammoniacum is also easily detected. This root is largely imported into Bombay and is used as incense by the Parsees in their fire temples.

Tests.—Sumbul Root contains from 5 to 6 p.c. of ash.

Preparation.

TINCTURA SUMBUL. TINCTURE OF SUMBUL.

Sumbul Root, 1; Alcohol (70 p.c.), 10; by maceration.

Now 1 in 10 instead of 1 in 8, and Alcohol (70 p.c.) used in place of Rectified Spirit.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Tests.—Tincture of Sumbul has a sp. gr. of 0·895 to 0·900; it contains about 2·5 p.c. w/v of total solids and about 66 p.c. w/v of Absolute Alcohol.

SUPPOSITORIA.

Suppositories are for the most part prepared by the following general formula:—

Melt the Oil of Theobroma; triturate the active ingredient intimately with a little of the Oil, and add the mixture to the remainder of the melted Oil in a basin or dish; stir well, and as the mixture begins to thicken pour it into the moulds, which may then be cooled with Water, or in summer by iced Water.

All difficulty in removing the suppositories from the moulds may be obviated by having the moulds previously wiped with oiled Lint.

It is convenient to weigh out ingredients for one or two more suppositories than are required by the prescription. The so-called 15-grain moulds, sold for suppositories, do not always hold exactly 15 grains; it is advisable to check their capacity.

In those rare circumstances where moulds are not available, the mixture may be allowed to cool, divided into the requisite number of parts, and shaped into a suitable form.

Hollow cones of suppository shape are made with Oil of Theobroma in various sizes; these can be filled with any desired medicament and closed with a plug; they are known as '**hollow suppositories.**'

In India and the Colonies a quantity of Beeswax may be added to suit the temperatures for the time being, so as to produce a desirable consistence.

Cocoa-nut **Stearin** (p. 1154), or a mixture of this with Oil of Theobroma, is a better basis for suppositories than Oil of Theobroma in cold weather.

Not Official.

SUPRARENAL GLAND.

The suprarenal or adrenal bodies or capsules are ductless glands each consisting of two portions which are distinct from a physiological point of view, the cortex and the medulla. A suprarenal body is thus two distinct and independent organs combined with one another. The fresh healthy glands of the ox or sheep are generally used for preparations. The substance causing a rise of blood pressure (Adrenalin) is found in the medulla only; regarding the functions of the relatively large cortical portion of the gland we have no definite information, although some comparative observations indicate that it may have important specific relations to the growth of the body, particularly to the genital organs. The active principle may be boiled without losing its activity, thus allowing the comparatively easy preparation of sterilised solutions; it is, however, prone to absorb Oxygen from the air and to become less active.

Medicinal Properties.—A powerful vaso-constrictor and cardiac tonic. It is of the greatest value in cases of sudden cardiac failure. An extract of the glands was first used in the treatment of Addison's disease, and numerous early cases are recorded, some showing beneficial effects, and others little or no improvement. The use of the extract has gradually been extended in other directions. It has been used in asthenia, anæmia, cyclic albuminuria, and in diabetes mellitus, in exophthalmic goître, heart disease and capillary hæmorrhages, in hay fever, epistaxis, and nasal catarrh, also in asthma. It has been found of great service in ophthalmic work as it lessens congestion and hastens absorption. It is useful in inflammatory conditions of the conjunctiva, and its use is also indicated in pannus, iritis, keratitis and acute dacryo-cystitis. It controls hæmorrhage in ophthalmic, nasal and obstetric work.

Applied locally it is a powerful astringent and hæmostatic. 1 drop of a 1 in 50,000 aqueous solution of the active principle blanches the normal conjunctiva within 1 minute. Of the dry extract 5 mg. per kilo body weight is sufficient to produce a maximum effect and about $\frac{1}{600}$ of a grain of the active principle is sufficient to produce a distinct effect upon the heart and arteries of an adult man. It has been recommended in Graves' disease, and as an adjunct to the treatment of lupus by the Finsen light. Administration by the mouth has not in some cases been found to be so efficacious as intravenous or subcutaneous injection. For cases of cardiac failure, it is best given intravenously, injections of $\frac{1}{200}$ to $\frac{1}{100}$ grain of Adrenalin being given. Subcutaneous injections of $\frac{1}{1000}$ to $\frac{1}{500}$ grain are recommended in ophthalmic practice to be used immediately before operation.

For introduction into the nose and ear, a 1 in 5000 solution of the active principle is used, or a 5 p.c. solution of the Extract. As an **ointment** 1 of Liquid Extract to 7 of Lanolin Ointment; as a **suppository** containing 2 or 3 minims of Liquid Extract.

5 to 20 minims of solution given every 6 hours in the treatment of neurotic heart.—*B.M.J.* '04, i. 1009.

A case where an unpleasant disturbance of smell, followed within a few hours by a diffuse urticaria extending over the trunk and arms, attended the use of a small swab saturated with Suprarenal Extract applied to the swollen inferior turbinate.—*M.P.* '05, ii. 305. 5 grains, increasing to 10, 15 and 20 grains, administered thrice daily in Addison's disease. An early diagnosis and an early trial of this form of treatment are of great importance.—*L.* '05, ii. 524.

Injections of Adrenal Extract or Epirenan very useful in severe shock and in poisoning by a general anæsthetic, but caution is needed if heart is weak from long and exhausting illness.—*B.M.J.E.* '05, ii. 52.

Tests.—The powder of desiccated Suprarenal Glands is partially soluble in Water. 0·5 of a gramme macerated with 25 c.c. of Water for a quarter of an hour and filtered yields a filtrate, which gives on the addition of a drop of Ferric Chloride T.S. an emerald-green coloration; the addition of Iodine Solution produces a deep rose-red coloration. It should not yield more than 7 p.c. of ash upon incineration. The active principle of the gland is Adrenalin, discovered by Dr. Jokichi Takamine.

Various preparations of the dried gland, of the extract (solid and liquid), and of the active principle have been introduced for medicinal use. The following include the best known preparations:—

GLANDULÆ SUPRARENALES (sicc. pulv.).—A dry, light brown or drab amorphous powder. Partially soluble in Water. 1 part represents about 5 of the fresh gland.

Dose.—5 grains = 0·32 gramme. Also supplied in tablets containing 0·1 gramme = 1½ grains.

DESICCATED SUPRARENALS (Suprarenal Capsules of the Sheep).—A light, fawn-coloured, or light brownish-yellow powder; 1 grain of the powder representing 8 grains of the fresh Suprarenals.

Dose.—1 to 3 grains = 0·06 to 0·18 gramme.

Official in U.S.

Desiccated Suprarenal Gland Tablets.—Each tablet containing 2 grains of the desiccated gland.

TABLET SUPRARENAL GLAND.—Each tablet represents 5 grains of the gland.

EXTRACTUM GLANDULÆ SUPRARENALÆ HÆMOSTATICUM.—A brown, or dark brown, hygroscopic, amorphous powder, readily soluble in Water. It is a very active preparation of the gland.

Dose.—1 to 3 grains = 0·06 to 0·2 gramme.

EXTRACTUM GLANDULÆ SUPRARENALÆ LIQUIDUM.—A Liquid Extract, 1 part of which is equal to 1 of fresh gland.

Extractum Suprarenalum Liquidum.—Macerate 100 of Trimmed Suprarenal Glands of the Sheep or Ox in 75 of Glycerin for 24 hours, strain and press, and make up the volume to 100 by means of Glycerin and Water in equal parts.—*B.P.C.*

LIQUOR SUPRARENALIS HÆMOSTATICUS.—A pale brownish or pinkish-brown liquid, containing the entire active principle of the gland. It has been used with great success as a **spray** in the treatment of hay fever, coryza, etc.

ADRENALIN. $C_9H_{13}NO_3$, eq. 181·77.—It is the active principle of the suprarenal gland, and in constitution partakes of the nature of an alkaloid. It forms a light, white, or almost white, microcrystalline powder, possessing a slightly bitter taste and leaving a feeling of numbness on the tongue. It is very sparingly soluble in cold Water, but dissolves more readily in hot Water. It dissolves readily in diluted Hydrochloric Acid. It is also soluble in Oleic Acid. The salts are mostly non-crystallisable. Solutions of the active principle readily absorb Oxygen from the air and pass into inactive substances. The active principle in the dry form is perfectly stable, it should, however, be kept in small well-closed glass phials of a dark amber tint in a cool atmosphere and exposed as little as possible. The form in which it crystallises is dependent upon the condition of the solution from which it is crystallised, and it has been known to exist in the form of prisms, fine needles, rhombic plates, boat or leaf-shaped crystals, or in the form of wart-like crystals.

Foreign Pharmacopœias.—Official in Belg. and Fr., not in the others.

Tests.—Adrenalin possesses a weak alkaline reaction towards moistened red Litmus paper, and it also has a faintly alkaline reaction towards Phenolphthalein Solution. The aqueous solution, particularly when alkaline, rapidly absorbs Oxygen from the air and passes from a colourless liquid to a pink, red, and eventually brown one. Its aqueous solution may be boiled without decomposition. The highly dilute aqueous solution has a strong action upon the small blood vessels, 1 drop of a 1 in 10,000 solution when instilled into the eye immediately blanches the conjunctiva. It raises the blood pressure, a dose of even about 0·0000005 gramme being sufficient to produce an effect. The diluted aqueous solution affords with Ferric Chloride T.S. an emerald-green coloration; with Iodine Solution a beautiful rose-pink coloration is produced. On the addition of Potassium or Sodium Hydroxide to the green coloured solution produced by Ferric Chloride T.S., the colour changes from purple to carmine red, and is destroyed when carefully neutralised with diluted acids, reverting to its original colour. Nitric Acid, Potassium Bichromate Solution and Potassium Ferricyanide Solution produce a similar rose-pink coloration to that produced by Iodine Solution. Gold Chloride Solution is immediately reduced by the aqueous solution of Adrenalin, a complete separation of the metal taking place. Although alkaloidal in constitution, it does not possess the chemical properties of an alkaloid, and its solutions are not precipitated by the usual alkaloidal precipitants, *e.g.*, Potassio-mercuric Iodide (Mayer's) Solution, Iodo-Potassium Iodide (Wagner's) Solution, Picric Acid Solution, Tannic Acid Solution, Phospho-Molybdic Acid Solution, and Platinum Chloride Solution. A drop or two of Potassium or Sodium Hydroxide Solution produces a reddish-brown coloration when added to Adrenalin, or even a very dilute Solution of Adrenalin, and simultaneously a distinctive disagreeable odour, resembling Hydrogen Phosphide, is produced. This test has been suggested (*P.J.* '07, i. 718) as a distinguishing test for Adrenalin, the following method being used in carrying it out:—A small quantity of the dry Adrenalin, or a few drops of the 1 in 1000 aqueous solution, is placed in a small porcelain crucible and mixed with 5 to 6 drops of a 10 p.c. Sodium Hydroxide Solution. The solution gradually becomes coloured, and simultaneously a distinctive odour is developed in a few seconds, more or less according to the amount of the Adrenalin present. In the case of a liquid containing substances likely to interfere with the reaction, these must be removed by previous treatment before applying the test. In the case of oily liquids the following method has been suggested (*P.J.* '07, ii. 310). Dissolve from 10 to 20 drops of the oily fluid or an equivalent amount of a solid preparation in about 10 times its volume of Ether and shake in a separatory funnel with 10 to 20 drops of Water acidified with Hydrochloric Acid. When the liquids have separated, the lower aqueous layer is transferred to a small capsule or beaker, heated on the water-bath for a few minutes to remove the Ether and traces of odorous substances, 6 or 8 drops of a 10 p.c. aqueous Sodium Hydroxide Solution are added and the whole covered with a watch-glass and set aside for 4 or 5 minutes. In the event of Adrenalin being present, the liquid will have acquired a distinct and peculiar odour suggesting Hydrogen Phosphide. Several methods have been advocated for the determination of Adrenalin. It has been suggested that both the reaction with Iodine and that with Ferric Chloride might afford a means of colorimetrically determining its amount, but none of the processes have been found to possess any real practical value.

A synthetic Adrenalin (Suprarenin) has been produced and is now a commercial article. The synthesis of substances allied to Adrenalin has been investigated by Jowett and a record of the researches appears in the *J.C.S. Trans.* '05, 967. The chief difference between the synthetic product and the natural appears to be the optical rotation. The natural Adrenalin is lævorotatory, whilst the synthetic Adrenalin, like most synthetic preparations, is optically inactive, and the synthetic preparation is consequently stated not to possess the same physiological activity as the natural product. As the result of experiments recorded (*P.J.* '08, i. 626) it has been shown that in respect to rise of blood pressure both substances are exactly alike, and that the optical activity is probably without any influence. A preparation consisting of three-fourths of the dextrorotatory modification and one-fourth of the lævorotatory is equally as active as the lævorotatory, although the latter has been alleged to be the sole active modification.

Jowett (*J.C.S. Trans.* '04, 192) has established the formula $C_9H_{13}NO_3$ for Adrenalin, and the correctness of this work and formula has been confirmed by Continental authorities working on the same subject.

Medicinal Properties.—It possesses the physiological activity of the medullary portion of the gland, but in a very much enhanced degree. It is the strongest hæmostatic known. It is in the form of dilute solution of this active principle that it is now generally used medicinally. As a daily injection of a 1 in 5000 solution in the treatment of laryngeal papillomata (*B.M.J.* '04, ii. 1224); in the hæmorrhage of typhoid (*B.M.J.* '04, ii. 1452); as a 1 in 1000 spray in aromatised neutral Oil in inflammatory affections of the nose and throat (*L.* '04, ii. 1160); as an injection of 4 to 8 c.c. of a 1 in 1000 solution in tuberculous pleural effusion (*B.M.J.* '04, ii. 1003); in the form of an ointment (1 in 1000) made with a basis of hard and soft Paraffin and Lanolin it has been used for nose and throat application.—*P.J.* '04, ii. 967. Adrenalin solutions have frequently been employed in hæmoptysis, but during the latter part of the year (1904) doubts have been entertained of the expediency of giving the drug either hypodermically or by the mouth in hæmoptysis.—*L.* '04, ii. 1446; *B.M.J.* '04, ii. 1636; '05, i. 68.

The number of cases of surgical shock in which it has been used are few (*L.* '05, i. 849), but there can be no doubt that it affords a very valuable means of treating this condition. When administered intravenously it should be used in very weak solutions. Is rapidly oxidised by the tissues, and its effects are fleeting, so that to be used effectively for raising the blood pressure it is necessary to administer it by continuous intravenous infusion. The strength of the infusion recommended is 1 in 40,000. Serious symptoms have been shown to follow the intravenous injection of 20 minims of a 1 in 1000 solution. If the blood pressure remains low and the patient continues in a dangerous condition of shock, a solution of Adrenalin in physiological salt solution, in the proportion of 1 in 20,000, should be intravenously infused at a rate of about 3 to 5 c.c. per minute.

It has been recommended (*B.M.J.* '05, ii. 125) in the treatment of serous effusions. As much as possible of the fluid is withdrawn by a 2-way trocar and canula, and through the canula still *in situ*, 1 drm. of Adrenalin Chloride (1 in 1000) diluted to ½ oz. with sterile Water, is introduced by means of an exploring syringe. The canula is then removed, the wound closed with Wool and Collodion, and in abdominal cases the abdomen is gently manipulated for 5 minutes and a binder firmly applied.

In the treatment of the hæmorrhage of typhoid (*B.M.J.E.* '05, i. 48), 20 minims of a 1 in 1000 solution are injected hypodermically every 3 hours until the hæmorrhage is arrested. By the mouth 10 minims may be given every hour.

It has been found useful (*B.M.J.* '05, i. 700) in lupus erythematosus owing to its tonic effect on the vascular system.

The dose of Adrenalin has been the subject of much controversy.

Maximal dose of Adrenalin and analogous preparations of the suprarenal capsules has been established by R. Muller (*A.J.P.* '05, 288), who recommends that doses 0·00009 gramme should not be exceeded. This quantity may be increased to 0·00015 gramme in cases where the patient is under the influence of an anæsthetic.

The new Belgian Pharmacopœia includes Adrenalin and gives tests by which it can be identified. According to the text the 1 in 1000 solution intravenously injected is fatal to a rabbit in a quantity equivalent to less than 0 001 gramme of the active principle per kilogramme of the animal; a dose of even about 0·0000005 gramme raises the blood pressure. This is the first official recognition of the principle of physiological standardisation.

Uses in ophthalmic surgery.—*Jour. of the Roy. Army Med. Corps* '08, i. 58.

Externally in form of ointment (1 of Chloride to 1000 of base) in neuralgia, neuritis and referred pain, applied along course of nerve involved.—*T.G.* '07, i. 293.

Good results in diabetes insipidus.—*B.M.J.E.* '07, ii. 12.

Prescribing Notes.—*When ordered in aqueous or other solution it is usually dissolved in just sufficient diluted Hydrochloric Acid to effect solution. A convenient basis for an oily preparation for a spray is a mixture of* 1 *part by weight of Absolute Alcohol, to* 4 *parts by weight of Castor Oil, previously dissolving the Adrenalin as above directed. The strength of the Adrenalin may vary from* 1 *in* 1000 *to* 1 *in* 4000, *according to the wishes of the prescriber; Oil of Gaultheria and Eucalyptol can be added as antiseptics.*

ADRENALIN CHLORIDE SOLUTION.—A transparent, almost colourless liquid, containing 1 part of Adrenalin Chloride, and 5 parts Chloretone in 1000 parts of Normal Saline Solution.

It should be kept in well-stoppered glass bottles of a dark amber tint in a cool atmosphere and exposed as little as possible to contact with the air and light. In neutral or faintly alkaline solution Adrenalin is liable to rapidly change in colour, but if the solution be made faintly acid in reaction, the change in colour does not take place with anything like the same rapidity.

For nasal, aural and ophthalmic use it may be diluted to form a 1 in 2000, a 1 in 5000, or a 1 in 10,000 solution.

Dose.—5 to 30 minims = 0·3 to 1·8 c.c. for internal administration.

Liquor Adreninæ Hydrochloricus.—Adrenine, 0·10; Chloroform, 0·50; Sodium Chloride, 0·90; Diluted Hydrochloric Acid, 0·25; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

INSUFFLATIO ADRENALINI COMPOSITA (Squire).—Adrenalin, 1 grain; Boric Acid, in fine powder, 1 oz.; Camphor, in fine powder, 1 oz.; Cocaine Hydrochloride, 1 grain; Menthol, 40 grains; Eucalyptus Oil, 10 minims; Lycopodium, 2 oz.

COMPOUND SUPRARENALIN SNUFF.—Boric Acid, 240 grains; Camphor, 20 grains; Cocaine Hydrochloride, 1 grain; Suprarenalin Powder, 1 grain; Lycopodium, 2 oz.; Menthol, 60 grains; Potassium Chlorate (in powder), 120 grains; Oil of Eucalyptus, 10 minims.—*Armour's Formulary.*

PULVIS SUPRARENALIS COMPOSITUS. *Syn.* Suprarenal Snuff.—Dry Suprarenal, 5; Boric Acid, in powder, 30; Camphor, 1·50; Menthol, in powder, 3; Oil of Eucalyptus, 1; Lycopodium, *q.s.* to produce 100.—*B.P.C.*

NEBULA ADRENALINI (Squire).—Adrenalin, 0·1; Sodium Chloride, 0·9; Chloretone, 0·25; Water, to 100.

Nebula Adreninæ.—Hydrochloric Solution of Adrenine, 20; Chloroform Water (1 in 200), sufficient to produce 100.—*B.P.C.*

NEBULA SUPRARENALIN ET COCAINÆ.—Suprarenalin or Adrenalin Solution (1 in 1000), 90 minims; Cocaine Hydrochloride, 9 grains; Distilled Water, 1 fl. oz.—*Bournemouth Formulary.*

Nebula Adreninæ cum Cocaina. Hydrochloric Solution of Adrenine, 20; Cocaine Hydrochloride, 2; Chloroform Water (1 in 200), *q.s.* to produce 100. —*B.P.C.*

SOLUTIO SUPRARENINI BORICI. Suprarenin, 0·1; Boric Acid, 0·25; Sodium Chloride, 0·9; Thymol, 0·06; Water, to produce 100.

A Suprarenin Borate prepared from synthetic **Suprarenin** may be employed in the preparation of the above solution.

Liquor Adreninæ Boricus, Boric Solution of Adrenalin.—Adrenine, 0·1; Boric Acid, 0·2; Chloroform, 0·5; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

SUPPOSITORIA ADRENALINI (Squire).—Adrenalin, ½ grain; Water, 16 grains; Boric Acid, 1 grain; Anhydrous Lanolin, 24 grains; Oil of Theobroma, *q.s.* to make 480 grains; divide into 32 suppositories.

SUPPOSITORIA ADRENALINI ET ÆSCULIN (Squire).—Adrenalin, ½ grain; Æsculin, 32 grains; Boric Acid, 1 grain; Water, 16 grains; Anhydrous Lanolin, 24 grains; Oil of Theobroma, *q.s.* to make 480 grains; divide into 32 suppositories,

SUPPOSITORIA SUPRARENALIN.—Suprarenalin, ½ grain; Boric Acid, 1 grain; Distilled Water, 15 minims; Anhydrous Lanolin, 50 grains; Cocoa Butter, 400 grains. Dissolve the Suprarenalin and Boric Acid in the Water. Mix with the Lanolin. Add the melted Cocoa Butter, pour into 15-grain moulds when cooling. Each suppository contains Suprarenalin $\frac{1}{60}$ grain equal to 16 minims of the 1 in 1000 solution.—*Bournemouth Formulary.*

Suppositoria Adreninæ, Adrenine Suppositories.—Adrenine, 0·1; Boric Acid, 0·2; Distilled Water, 3; Wool Fat, 10; Oil of Theobroma, 100.—*B.P.C.*

UNGUENTUM ADRENALINI (Squire).—Adrenalin, 0·1; Diluted Hydrochloric Acid, 0·2; Water, 2; Soft Paraffin, 33; Hydrous Wool Fat, sufficient to produce 100.

Unguentum Adreninæ, Adrenine Ointment.—Adrenine, 0·1; Boric Acid, 0·2; Water, 3; Hydrous Wool Fat, 50; Soft Paraffin, to produce 100.—*B.P.C.*

An **Unguentum Adreninæ Mitis,** *B.P.C.*, is prepared by diluting 1 of the above Ointment to 5 with Soft Paraffin and perfuming with Otto of Rose (1 to 1000).

Unguentum Adreninæ Album, White Adrenine Ointment.—Adrenine, 0·1; Hydrochloric Acid. *q.s.*; Castor Oil, 5; Absolute Alcohol, 2; White Soft Paraffin, to produce 100.—*B.P.C.*

UNGUENTUM SUPRARENALIN ET COCAINÆ.—Suprarenalin, ½ grain; Boric Acid, 1 grain; Cocaine Hydrochloride, 5 grains; Distilled Water, 15 minims; Hydrous Lanolin, 250 grains; Vaseline, 250 grains. Dissolve the first 3 ingredients in the Water and mix with the Lanolin and Vaseline. Contains Suprarenalin, 1 in 1000, Cocaine Hydrochloride, 1 in 100.—*Bournemouth Formulary.*

This has been incorporated in the *B.P.C.*

EPINEPHRIN.—A white, or greyish-white powder, which is regarded by Abel and Crawford as the active principle of the suprarenal gland.

Its chemical constitution has been recently investigated by Dr. Jowett.—*B.M.J.E.* '99, i. 35; *P.J.* '03, i. 1; '04, i. 247.

SUPRARENALIN.—A light yellow, stable non-hygroscopic crystalline powder. Slightly soluble in cold Water and in Alcohol. It is stated to possess all the therapeutic properties of the Suprarenal Capsules.

Suprarenalin Solution.—A slightly alkaline stable solution, containing 1 of Suprarenalin in 1000.

RENAGLANDIN.—A light brown syrupy liquid. It is stated to be a concentrated and aseptic fluid extract of suprarenal gland. Each fl. drm. is equivalent to 5 grains of the fresh gland.

RENALINE.—A greyish-white crystalline powder, only slightly soluble in cold Water, more readily soluble in warm Water. It gradually darkens in colour when exposed to the air and light. It forms definite salts with the Acids; the chief salt being Hydrochloride. It is also sold in the form of a 1 in 1000 solution and in glass capsules containing 1, 2 and 5 c.c. of a sterilised solution (1 in 1000, 1 in 2000, or 1 in 10,000).

NEBULA EXTRACTI SUPRARENALIS.—Suprarenal Extract, 48 grains; Sodium Sulphate, 10 grains; Boiling Distilled Water, to 1 fl. oz. = 10 p.c. solution.—*Central Throat.*

SUPRARENAL OINTMENT.—Liquid Extract of Suprarenal Gland, 50 minims; Liquid Paraffin, 2 drm.; Hydrous Wool Fat, to 1 oz. It may be scented with Otto of Rose.—*Martindale.*

Unguentum Suprarenalis.—Liquid Extract of Suprarenals, 10; Liquid Paraffin, 25; Hydrous Wool Fat, *q.s.* to produce 100. This ointment is sometimes perfumed with Otto of Rose.—*B.P.C.*

Not Official.

SYRUPI.

Syrups are apt to ferment or become mouldy when made with too little Sugar, and to crystallise when too concentrated, or when mixed with Acids or Alcohol. There is no uniformity in the method given in *B.P.* for the 22 Syrups which are official. In 7 of them the final product is directed to be made to a given volume by the addition of Water or of Syrup, and in 3 of them to a given weight. The sp. gr. is mentioned in 2 of them, Syrupus, and Syrupus Ferri Iodidi. In the case of Syrupus Sennæ and Syrupus Tolutanus, the fluid is made up to a given volume by the addition of Distilled Water before the Sugar is dissolved in it, but in Syrupus Hemidesmi and Syrupus Rosæ no such precaution is taken. Syrupus Aurantii and Syrupus Zingiberis are both mixtures of a Tincture with Syrup, but the latter is made up to a definite volume, the former is not.

Not Official.

TABACI FOLIA.

LEAF TOBACCO.

The dried Leaves of the Virginian Tobacco, *Nicotiana Tabacum*, L.

Official in *B.P.* '85, but now omitted.

When dry they yield about 20 p.c. of ash, containing a large proportion of Potassium Carbonate.

The Virginian leaf contains about 6 p.c. of **Nicotine,** and is one of the strongest varieties of Tobacco.

Medicinal Properties.—A powerful depressant, especially affecting the heart and respiration. Smoked, it is sedative and antispasmodic in various cases of asthma. Occasionally used as snuff for its errhine action, increasing the flow of nasal mucus.

It forms the basis of a proprietary article for the relief of neuralgia of the face.

Nicotine is one of the most powerful and rapid poisons known.

Smoke from both tobacco and hay found to be bactericidal to pathogenic bacteria.—*L.* '07, i. 1220.

Tobacco-juice (a strong infusion) is a powerful insecticide, but some preparations for this purpose contain Arsenic in addition to the Tobacco, and in a case that came under our notice, several animals were killed by the Arsenic.

Antidotes.—In case Tobacco has been swallowed, an emetic; stimulant, internal and external. Recumbent position; Tannic Acid; Nux Vomica or Strychnine.

Official in Ger., Mex., Port. and Span., Folia Nicotiana.

Enema Tabaci.—Leaf Tobacco, 20 grains; Boiling Water, 8 fl. oz.—*B.P.* 1867; omitted in *B.P.* 1885 and 1898, now included in the *B.P.C.* with a note that it is rarely used.

NICOTINA ($C_{10}H_{14}N_2$, eq. 160·98).—A nearly colourless, volatile, oily liquid, with an acrid, burning taste, inflammable, miscible with Water, Ether, Alcohol, and the fixed Oils. It should be kept in well-stoppered glass bottles of a dark amber tint in a cool atmosphere and exposed as little as possible to contact with air and light, as it has a tendency to become darker in colour and to resinify. To this alkaloid Tobacco owes its activity. The most easily crystallised salt is the Acid Tartrate. Nicotine is intensely poisonous, and is seldom, if ever, used therapeutically.

The antidotal action of Strychnine, Eserine and the cruciferous plant *Nasturtium officinale*, to Nicotine has been compared, the result being that the expressed juice of *Nasturtium officinale* is claimed (*L.* '05, i. 1596) to be *par excellence* the antidote to Nicotine.

When injected intravenously Nicotine causes (*L.* '05, i. 851) a tremendous increase in the blood pressure. Its effects, however, are transient, the pressure falling to or even below the normal after a few minutes.

Tests.—Nicotine has a sp. gr. of 1·011. It boils at about 250° C. (482° F.). It possesses a strong alkaline reaction towards red Litmus. It is powerfully lævogyrate. It may be determined in aqueous solution in the absence of other free bases by direct titration with Tenth-normal Volumetric Sulphuric Acid Solution, using Methyl Orange Solution as an indicator of neutrality. 1 c.c. of Tenth-normal Volumetric Acid Solution being equivalent to 0·016098 gramme of pure Nicotine. Nicotine is precipitated by the usual alkaloidal reagents, *e.g.*, Potassio-mercuric Iodide (Mayer's) Solution, Iodo-Potassium Iodide (Wagner's) Solution, etc. The distinctive reactions by which it may be identified are the formation of a yellow amorphous precipitate rapidly becoming crystalline, on the addition of Picric Acid Solution in excess to a solution of Nicotine, or of a Nicotine salt; by the formation of a yellow crystalline precipitate soluble in hot Water, on the addition of Platinic Chloride Solution to a solution of Nicotine in dilute Hydrochloric Acid; by the formation of a crystalline precipitate on the addition of Mercuric Chloride Solution to an aqueous solution of Nicotine, the precipitate being soluble in diluted Hydrochloric Acid or in Acetic Acid. The appearance of this precipitate under the microscope is distinctive. Nicotine distils in the vapour of steam.

NICOTINÆ SALICYLAS (Eudermol).—Colourless, transparent crystals, or a white, crystalline powder, possessing a faint empyreumatic odour. It is soluble in Water and in Alcohol (90 p.c.). It has been introduced as a remedy for scabies, used in the form of a 1 p.c. ointment made with Vaseline or Lanolin.—*B.M.J.E.* '99, ii. 47; *P.J.* '99, i. 227.

Tests.—Nicotine Salicylate dissolves readily in Water, forming a clear solution which is faintly acid in reaction towards blue Litmus paper. It answers the tests distinctive of Nicotine given under the heading of Nicotina. A concentrated aqueous solution, when acidified with Diluted Sulphuric Acid, yields a white precipitate soluble in Ether. If the precipitated acid be separated, washed free from mineral acid, and carefully dried, it should possess the m.p. and answer the tests distinctive of Salicylic Acid given under Acidum Salicylicum.

Not Official.

TABELLÆ.

TABLETS.

The tablet is one of the most popular forms for the administration of drugs. Tablets of comparatively high finish can be made extemporaneously at the dispensing counter with care in manipulation and due regard to the composition of the drugs to be compressed. Tablets may be machine-made when it is required to turn them out in a polished coherent state, using as little pressure as necessary for that purpose, or in the form of tablet triturates, which are generally moulded by hand.

For the compounding of Compressed Tablets, Messrs. E. White and R. A. Robinson, Jun., suggested (*C.D.* '02, 271, 299; *P.J.* '02, 140, 172) a mixture of Oil of Theobroma 1, and Starch 3 parts, the Oil being melted and the Starch powder stirred in before cooling; of this mixture 1 part is added to each 4 parts of the powder to be compressed, unless much Sugar be present, when more of the powder is required; it is mixed thoroughly without pressure in a mortar, divided into doses, and each dose compressed. This method is excellent for small quantities of tablets, facilitating the compression, and as a white excipient it is an advantage; the mixture of medicament with the Starch-Theobroma excipient should be quite cold before beginning the compression, otherwise it has a tendency to adhere to the parts of the machine and cause trouble. Subsequently Messrs. E. White and H. Rodwell found on further experience (*C.D.* '03, ii. 231; *P.J.* '03, ii. 156, 211) that the Theobroma and Starch excipient is not applicable on a large scale by means of machines with an automatic feed arrangement, except in certain cases where the mixture of substance and excipient happens to form a fairly granular powder capable of flowing evenly and uniformly from the hopper to the die. They have experimented with the object of removing that defect and to devise a method by which, when the tablets are crushed between the fingers or between paper, a soft and smooth powder could be produced. The problem resolved itself into the possibility of devising methods by which the Oil of Theobroma could be uniformly distributed throughout the material to be compressed, forming at the same time a granulated product capable of automatic feeding and compression into a coherent polished tablet with the minimum of force. They recommended the two methods here given.

METHOD I.—Theobroma Emulsion.

Oil of Theobroma 25, Hard Soap 5, Tragacanth 0·5, Benzoic Acid 0·25, Water to 100. Dissolve the Soap in 25 parts of Water by heat, add the hot solution to the melted Theobroma, and mix by whisking or agitation; shake in the Tragacanth, add the Benzoic Acid, then the remainder of the Water.

Gum Acacia may be used in place of Soap without making any appreciable difference in the general utility of the product. The product in either case should be a thick, smooth, white cream, free from lumps. The addition of Benzoic Acid is only necessary as an antiseptic precaution if the product be kept in stock.

The method of application is as follows:—The substance to be compressed, in the finest possible powder, should be triturated with sufficient of the emulsion to form a damp coherent powder—just so damp that it can be shaken through a No. 20 or 30 sieve without pressure and without adhering to the meshes. The sifted product, after exposure to the air for a few hours, or during the night, is ready for compression. If the drying process be accelerated by the aid of artificial heat, the dried product must be allowed to stand for an hour or two at least for the Theobroma to solidify before compression is attempted, but in the majority of cases it is better to avoid the use of artificial heat.

If the bulk of substance to be compressed in each tablet either demands or allows the addition of any diluting material, cane sugar is best; in no case does it interfere with the production of a good tablet. When the substance to be compressed is of a dusty nature, and has little tendency to cohere on compression, the addition of a little Glucose is advantageous, the tablet having a better finish and less liability to crack after compression.

METHOD II.—Ether-Alcohol Solution of Theobroma.

Oil of Theobroma 1 oz., Ether to 6 oz. Dissolve and add an equal volume of Rectified Spirit as required for use.

The manner of granulating with the above is to add it to the substance or mixture contained in a mortar, trituration being accomplished as quickly as possible, the whole of the solution required being added at once. The mass is then passed through a No. 20 or 30 sieve and allowed to dry by exposure.

Compression can, in some cases, be proceeded with almost immediately, but it will be found more satisfactory generally to allow the mixture to stand for an hour or two. Sugar granulates remarkably well with the above excipient, and the previous remarks on its addition apply here as well.

Not Official.

TALC.

CRÆTA GALLICA, FRENCH CHALK, SOAPSTONE.

A white, or almost white, impalpable powder, or in greyish irregular masses, possessing a waxy lustre. It has a characteristic saponaceous feeling to the skin, is practically odourless and tasteless. It is a hydrated Magnesium Silicate. It is insoluble in Water, insoluble in dilute acids, and in dilute solutions of alkali Hydroxides.

Foreign Pharmacopœias.—Official in Fr., Ger., Swiss and U.S.

Tests.—Talc has a sp. gr. of about 2·5. When fused with a mixture of anhydrous Sodium and Potassium Carbonates it leaves a residue which, dissolved in hot Water, filtered, the filtrate acidified with Hydrochloric Acid, evaporated to dryness, reacidified with Hydrochloric Acid, again evaporated to dryness, treated with Water and filtered, leaves on the filter an insoluble residue of Silica; when sufficient Ammonium Chloride is added to the filtrate to hold the Magnesium in solution, it yields on the addition of Ammonia Solution a white gelatinous precipitate, indicating the presence of Aluminium, and if this precipitate be removed by filtration, the filtrate affords on the addition of Sodium Phosphate Solution a white crystalline precipitate, indicating the presence of Magnesium. The Talc should not contain more than 5 p.c. of matter soluble in Diluted Hydrochloric Acid, as determined by boiling a weighed quantity of 1 gramme for 30 minutes with 25 c.c. of Diluted Hydrochloric Acid, maintaining the volume by the addition of Water from time to time, filtering and evaporating the filtrate to dryness, igniting and rapidly weighing.

PURIFIED TALC.—A white, or almost white, inodorous, impalpable powder, insoluble in Water, insoluble in dilute mineral acids and insoluble in dilute solutions of the alkali Hydroxides. It is obtained from native Talc by removing the matter soluble in Hydrochloric Acid by repeatedly boiling with a mixture of Hydrochloric Acid and Water, the purified product being washed with Water until a portion of the wash Water is neutral to Litmus, and yields no opalescence with Silver Nitrate Solution, after acidification with Nitric Acid. It is dried at 110° C. (230° F.).

Medicinal Properties.—It is employed as a soothing and protecting powder to the skin and is an ingredient in many 'dusting powders' and 'face powders.' It is also employed as a filtering medium to clarify turbid liquids.

Foreign Pharmacopœias.—Official in the U.S.P. It also appears in the *B.P. Appendix.*

Tests.—Purified Talc, when fused with a mixture of anhydrous Sodium and Potassium Carbonates, should answer the corresponding tests given under Talc. The soluble matter should not amount to more than 0·05 p.c. as determined by boiling 10 grammes of the purified Talc for 30 minutes with 50 c.c. of Water, maintaining the volume by the addition of Water from time to time, filtrating and evaporating one half the filtrate to dryness. The remaining half, when acidified with Hydrochloric Acid, should yield no blue colour on the addition of Potassium Ferrocyanide Solution, indicating the absence of Iron. When ignited at a dull red heat it should leave a residue amounting to not less than 95 p.c.

BORATED TALC.—Boric Acid, in fine powder, 10, Purified Talc 90.

TAMARINDUS.

TAMARINDS.

Fr., Tamarin; Ger., Tamarindenmus; Ital., Tamarindo; Span., Tamarindo.

The Fruits of *Tamarindus Indica*, L., freed from the brittle outer part of the pericarp and preserved with Sugar.

Imported from the West Indies.

Medicinal Properties.—Refrigerant and slightly laxative. Infused with Water, forms a cooling drink in febrile affections; it may also be given with Milk to form **Tamarind Whey** (1 Pulp in 40).

Dose.—¼ oz. = 7·1 grammes and upwards.

Official Preparation.—Contained in Confectio Sennæ.

Official in all the Foreign Pharmacopœias except Dan.; Fr. and Ger. (a crude and a strained).

Descriptive Notes.—The Tamarinds of commerce consist of the fruit deprived of its hard epicarp, and are imported in three forms, viz., West Indian, preserved in Syrup and packed in barrels; East Indian, deprived of the epicarp and pressed into loose masses; and Egyptian, pressed into hard circular flattened cakes, 4 to 8 in. (10 to 20 cm.) in diameter and 1 to 2 in. (25 to 50 mm.) thick. The pulpy part consists of the mesocarp; the leathery endocarp encloses the seeds. Judging from the official description, the West Indian Tamarinds are apparently intended to be used; the pulp should not yield any characteristic reaction for Copper with the test for that metal, which is only likely to be present in the West Indian Tamarinds. The cheaper Egyptian Tamarinds are said to be used for curries and sauces, and in the manufacture of tobacco. On the Continent East Indian Tamarinds are the kind principally used in pharmacy.

Tests.—Tamarinds contain an amount of acid equal to about 10 p.c. calculated as Tartaric Acid. In the event of Copper vessels being used, Tamarinds are liable to take up this metal.

TARAXACI RADIX.

TARAXACUM ROOT.

Fr., Pissenlit; Ger., Löwenzahn; Ital., Tarassaco
Span., Hoja de Taraxacón.

The fresh and the dried Roots of *Taraxacum officinale*, Wiggers.

It is officially required to be collected in the autumn, but the root is best in the very late autumn or winter months, or in the early spring.

Medicinal Properties.—A mild laxative and bitter tonic, given in atonic dyspepsia with habitual constipation.

Official Preparations.—Extractum Taraxaci, Extractum Taraxaci Liquidum, and Succus Taraxaci.

Not Official. Decoctum Taraxaci, Elixir Taraxaci Compositum, Liquor Taraxaci.

Foreign Pharmacopœias.—Official in all except Belg., Dan., Dutch and Norw.; Fr. (Pissenlit); Ital. (Tarassaco); Mex. (Diente de Leon).

Descriptive Notes.—Taraxacum or Dandelion Root varies in size according to age, from 8 to 12 in. (20 to 30 cm.) long, and from ½ to 1 in. (12·5 to 25 mm.) in diameter, and is sometimes branched in the upper portion, due to the original crown of the root being drawn into the earth and giving off lateral buds which form rootstocks. Externally the root is pale brown when fresh, but darker brown when dry, with a short fracture showing a thick white cortex, having numerous translucent concentric rings containing laticiferous vessels, and a yellow porous woody centre.

The root, both fresh and dried, is official, and is directed to be collected in the autumn. The *P.G.* directs the whole plant to be collected in spring before flowering. The juice of the root quickly undergoes alteration on exposure to the air. The dried root is much attacked by insects, and should not be kept more than a year. The roasted root is used to form Dandelion Coffee.

Tests.—Taraxacum Root contains from 4 to 5 p.c. of ash.

Preparations.

EXTRACTUM TARAXACI. Extract of Taraxacum.

Crush fresh Taraxacum Root; press out the juice; allow the feculence to subside; heat the liquid to 212° F. (100° C.), and maintain the temperature for 10 minutes; strain; evaporate to the consistence of a soft extract.

Dose.—5 to 15 grains = 0·32 to 1 gramme.

Official in Ital. and U.S., from **fresh root**; Fr., from **dried leaves**; Austr., Dutch., Hung., Port., Russ. and Swed., from **whole plant**; Ger. and Jap., from **dried root**; Mex., from **root** and **leaves**.

EXTRACTUM TARAXACI LIQUIDUM. Liquid Extract of Taraxacum.

Macerate 20 of dried Taraxacum Root (in No. 20 powder) in 40 of Alcohol (60 p.c.) for 48 hours; press out 10 of liquid; add to the pressed residue 40 of Distilled Water; macerate for 48 hours, press out the liquid, strain and evaporate to 10; mix this with the former 10 to make the total measure 20; filter.

When made in this way it deposits greatly. A much better Fluid Extract is made by percolation with Alcohol (30 p.c.).

Dose.—½ to 2 fl. drm. = 1·8 to 7·1 c.c.

Foreign Pharmacopœias.—Official in Russ. and U.S.

Tests.—Liquid Extract of Taraxacum has a sp. gr. of 1·040 to 1·060; it contains from 16 to 25 p.c. w/v of total solids and about 25 p.c. w/v of Absolute Alcohol.

SUCCUS TARAXACI. Juice of Taraxacum.

3 of the expressed Juice from bruised fresh Taraxacum Root, mixed with 1 of Alcohol (90 p.c.); after 7 days, filter.

Dose.—1 to 2 fl. drm. = 3·6 to 7·1 c.c.

Not Official.

DECOCTUM TARAXACI.—Dried Dandelion Root, 1; Distilled Water, *q.s.* to produce 20, after boiling for 10 minutes and straining.—*B.P.* 1885.

This has been incorporated in the *B.P.C.*

ELIXIR TARAXACI COMPOSITUM.—Fluid Extract of Taraxacum 3·5, Fluid Extract of Wild Cherry 2, Fluid Extract of Licorice 6, Tincture of Sweet Orange Peel 6, Tincture of Cinnamon 3·5, Compound Tincture of Cardamom 3, Aromatic Elixir, *q.s.* to produce 100. Mix them, allow to stand several days if convenient, and filter. Average dose.—8 c.c. (2 fl. drm.).—*U.S.N.F.* 1896.

This has been incorporated in the *B.P.C.*, but *U.S.N.F.* 1906 has altered the quantity of Tincture of Cinnamon from 3·5 to 3·0.

LIQUOR TARAXACI.—A preparation resembling the Succus, but in which the Alcohol (90 p.c.) is added directly to the bruised root before pressing. Introduced many years before the Succus and superior to it. The opinion (*C.D.* '92, i. 612) is wrong that Liquor in this case is synonymous with Fluid Extract, since the root depreciates considerably in the drying, before powdering.

TEREBENUM.

TEREBENE.

A transparent, colourless, mobile, optically inactive liquid.

It consists for the most part of the hydrocarbons Dipentene and Terpinene, with some Cymol and Camphene.

Terebene is described by the *B.P.* as a mixture of Dipentene and other hydrocarbons obtained by agitating Turpentine Oil with successive quantities of Sulphuric Acid until it no longer rotates the plane of a ray of polarised light, subsequently distilling in a current of steam; the *U.S.P.* describes it as a liquid consisting of Dipentene and other hydrocarbons obtained by the action of concentrated Sulphuric Acid on Turpentine Oil and subsequent rectification with steam.

It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from contact with the light.

Solubility.—1 in 6½ of Alcohol (90 p.c.); in all proportions of Absolute Alcohol or Chloroform; 1 in 3¾ of Ether; 5 in 8 of Glacial Acetic Acid; very sparingly in Water.

Medicinal Properties.—Antiseptic. A stimulating, disinfecting, expectorant in winter cough (chronic bronchitis). It can be used as an inhalation, mixed with Magnesium Carbonate and hot Water, or from an antiseptic respirator.—*B.M.J.* '86, i. 259, 392; '87, i. 796; *P.J.* (3) xvi. 611. In phthisis, *Pr.* liii. 275.

Dose.—5 to 15 minims = 0·3 to 0·9 c.c.

Prescribing Notes.—*Small doses may be taken on* **sugar.** *It may be given in* **mixture** *suspended with Mucilage of Gum Acacia, in* **flexible capsules, lozenges** *or* **pastils.**

Not Official.—Vapor Terebenæ, Terpin Hydrate, and Terpinol.

Foreign Pharmacopœias.—Official in Russ. and U.S.

Tests.—Terebene has a sp. gr. of 0·862 to 0·876; the *B.P.* states 0·862 to 0·866; the *U.S.P.* states from 0·860 to 0·865 at 25° C. (77° F.). It is officially stated not to rotate the plane of a ray of polarised light. It boils between 165° and 175° C. (329° and

347° F.). The *B.P.* states that it should distil between 156° and 180° C. (312·8° and 356° F.), but these limits are generally considered too wide, and admit an optically active specimen. Most commercial samples possess a slight action on polarised light. Naylor (*C.D.* '99, ii. 230) could not imagine why optically inactive Terebene was introduced into the *B.P.*, when the reputation was made on an optically active preparation. *U.S.P.* states that it boils at 160° to 170° C. (320° to 338° F.).

The more generally occurring impurities are acid, undecomposed Turpentine Oil and resinous substances. A piece of blue Litmus paper moistened with Water should not be reddened by a drop of the specimen, indicating the absence of acidity. The sample should be almost completely inactive towards polarised light, indicating the absence of undecomposed oil. When evaporated in a porcelain dish on a water-bath, not more than a slight residue should be left, indicating the absence of more than traces of resinous substances. The *B.P.* requires that not more than 15 p.c. should distil below 165° C. (329° F.), but this statement requires modification, as it would admit specimens of a very bad quality. It is officially required to leave after distillation only a slight viscid residue, indicating the absence of excess of Resin.

Not Official.

VAPOR TEREBENÆ.—Pure Terebene, 40 minims; Light Magnesium Carbonate, 20 grains; Distilled Water, to 1 oz.—*Throat* and *Central Throat*.

TERPIN HYDRATE ($C_{10}H_{20}O_2$, H_2O, eq. 188·74).—Colourless, glistening, rhombic prisms, or a crystalline powder, possessing a faint aromatic odour, and a somewhat bitter taste.

The *U.S.P.* describes it as the Hydrate of the diatomic Alcohol, Terpin. It is official in *U.S.P.* and *P.G.*, but not in the *B.P.*

It should be kept in well-closed bottles of a dark amber tint.

Solubility.—1 in 280 of Water; 1 in 14 of Alcohol (90 p.c.); 1 in 46 of Alcohol (60 p.c.).

The solubility figures for Terpin Hydrate in Water, Alcohol (90 p.c.) and Alcohol (60 p.c.) given in the *B.P.C.* have evidently been derived from the *Companion*. The figures for the solubility in boiling Alcohol, in Ether, and in Chloroform appear to have been taken from the *U.S.P.*, those for the two latter are incorrect for the solubility of the substance in Ether and in Chloroform at the temperatures at which (in the preface) the *B.P.C.* solubilities are stated to have been determined, but are correct for a temperature of 25° C. (77° F.), provided in the case of Ether, that Ether *U.S.P.* (sp. gr., 0·720) is used as a solvent; the point appears to have been ignored in the *B.P.C.* that the Ether *B.P.* is not Ether *U.S.P.*

Used as an expectorant to reduce secretion in bronchitis and other respiratory disorders.—*Pr.* liv. 383.

Dose.—3 to 10 grains = 0·2 to 0·65 gramme.

Foreign Pharmacopœias.—Official in Dutch, Fr., Ger., Ital., Jap., Mex., Norw., Russ., Span. (Terpina), Swed., Swiss and U.S.

Tests.—Terpin Hydrate melts at about 116° C. (240·8° F.); the *U.S.P.* states at 116° to 117° C. (240·8° to 242·6° F.), when quickly heated; the *P.G.* 116° C. (240·8° F.), and loses Water, the m.p. reverting to 102° C. (215·6° F.). When heated it loses its Water, and at a temperature of 258° C. (496·4° F.) anhydrous Terpin distils over, solidifying to a crystalline mass possessing a m.p. of about 102° C. (215·6° F.). It affords an orange-yellow colour on treatment with Sulphuric Acid. The hot aqueous solution is rendered turbid by the addition of a few drops of Sulphuric Acid, a characteristic powerful aromatic odour being simultaneously evolved. It should possess no pronounced terebinthinate odour. It dissolves readily in hot Alcohol (90 p.c.), to form a clear solution which should not possess an acid reaction towards blue Litmus paper.

TERPINOL.—A colourless, or nearly colourless liquid, possessing a strong hyacinthine odour. It is a mixture of Terpenes with variable proportions of **Terpineol.** It has a tendency to thicken and darken on exposure to air and light. It is practically insoluble in Water, but soluble in Alcohol (90 p.c.) and in Ether.

Official in Span.

Dose.—2 minims = 0·12 c.c.

TEREBINTHINA CANADENSIS.

CANADA TURPENTINE.

B.P.Syn.—CANADA BALSAM.

A clear, pale yellow, or greenish-yellow, slightly fluorescent, viscous oleo-resin, possessing a terebinthinate odour and a somewhat bitter taste.

The oleo-resin official in the *B.P.* is obtained from Abies balsamea, Mill. The liquid oleo-resin official in the *U.S.P.* is obtained from the same tree. It is also derived from *Pinus Fraseri*, Pursh., in Pennsylvania and Virginia, and from *Abies Canadensis*, Mich.

A solution of the hard brittle solid left on the evaporation of the volatile Turpentine when dissolved in Benzol, Toluol, or Xylol is much used as a medium for mounting microscopical objects, and as a cement for glass; it is also used in its natural state for the same purpose.

Solubility.—Soluble in all proportions of Benzol, Chloroform and Ether; 1 in 3 (*or less*) of absolute Alcohol; 1 in 1 (*or less*) of Alcohol (90 p.c.).

Seldom used internally; its medicinal properties are similar to those of Oleum Terebinthinæ.

It is used in the preparation of Collodium Flexile.

Foreign Pharmacopœias.—Official in U.S.

Tests.—Canada Balsam by long exposure to the air or quickly when heated, loses about 25 p.c. of its weight of volatile Oil and forms a hard, brittle solid, which dissolves in Benzol, Toluol or Xylol. It solidifies when mixed with about one-sixth of its weight of Magnesia moistened with a little Water; the *U.S.P.* mentions when mixed with 20 p.c. of its weight of Magnesium Oxide previously moistened with Water. The Ester value of the Balsam varies from 4·5 to 9·8, the Acid value from 84·9 to 85·9, and the Saponification value from 89·4 to 95·7. The Balsam is stated (*C.D.* '04, i. 439) to have a sp. gr. of 0·987 to 0·994, an optical rotation of + 1° to + 4° in a 100 mm. tube, a refractive index at 20° C. (68° F.) of 1·518 to 1·521 and an Acid value of 84 to 87. The Volatile Oil is stated to have a sp. gr. of 0·862 to 0·865, an optical rotation of − 26° to − 29° in a 100 mm. tube, a refractive index at 20° C. (68° F.) of 1·472 to 1·477 and an Ester content calculated as Bornyl Acetate of 0·4 to 0·6 p.c. The *B.P. Codex* stated that 'the Volatile Oil consists chiefly of Lævo-pinene, that the sp. gr. of the Oil is about 0·987 to 0·994, optical rotation, +1° to +4°, refractive index, 1·518 to 1·521; Acid value, 84 to 87.' The word 'Oil' was subsequently altered to 'Turpentine' in the list of additions and corrections.

Not Official.

TEREBINTHINA CHIA.

CHIAN TURPENTINE.

An oleo-resin obtained from the incised trunk of *Pistacia Terebinthus*, collected in Scio. A soft solid with a characteristic odour. When treated with its own weight of Absolute Alcohol or pure Ether, the greater portion is dissolved.

Was recommended in cancer.—*L.* '87, ii. 1005, 1144, 1190, 1244.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Official in Port.

PILULA TEREBINTHINÆ CHIÆ. — Chian Turpentine, 6 grains; Sublimed Sulphur, 4 grains. To be made into 2 pills, and taken every 4 hours.

A case is reported of these pills forming a compact mass in the bowel, removed by enemas.—*C.D.* '90, ii. 75.

TEREBINTHINÆ OLEUM.

OIL OF TURPENTINE.

FR., ESSENCE DE TÉRÉBINTHINE OFFICINALE; GER., TERPENTINOL; ITAL., ESSENZA DI TREMENTINA; SPAN., ESENCIA DE TREMENTINA.

A transparent, colourless, or nearly colourless, limpid liquid.

The volatile Oil official in the *B.P.* is obtained from *Pinus sylvestris* and other species of *Pinus*, and is rectified if necessary. The *U.S.P.* includes both an Oil of Turpentine and a rectified Oil of Turpentine. The Oil is described as a volatile Oil recently distilled from Turpentine; Turpentine *U.S.P.* is described as a concrete oleo-resin obtained from *Pinus palustris*, Miller, and from other species of *Pinus*. The *P.G.* also includes a Turpentine Oil and a rectified Oil of Turpentine. The Oil of Turpentine *P.G.* is described as a volatile Oil obtained from different species of *Pinus*. The rectified Oil of Turpentine of the *U.S.P.* is prepared by treating the Turpentine Oil with Sodium Hydroxide Solution (about 5 p.c.) and re-distillation. That of the *P.G.* by treatment with Calcium Hydroxide Solution and re-distillation; in each case three-fourths of the distillate is collected.

It should be kept in well-closed glass vessels, preferably of a dark amber tint and in a cool atmosphere.

The Oil of Turpentine sold in Britain is almost wholly imported from America, and is the product (mainly) of *Pinus palustris*, Mill., and *P. Tæda*, L. German and Russian Oil is principally distilled from *P. sylvestris*, L.; French Oil from *P. Pinaster*, Sol. Hungarian Oil of Turpentine is distilled from the cones of *P.P umilis*, Haenke, and Carpathian Oil of Turpentine, also known as Riga Balsam, from *P. Cembra*, L.

Oil of Turpentine, especially Russian, when exposed to the continuous action of atmospheric air in presence of Water, develops a large quantity of Hydrogen Peroxide, Camphoric Acid, and other oxygenated products, which form the basis of the '**Sanitas**' series of disinfectants.

Oil of Turpentine dissolves Beeswax, Iodine, Sulphur, Phosphorus, fixed Oils; also Resins, forming varnishes.

Solubility.—1 in 6½ of Alcohol (90 p.c.); in all proportions of Absolute Alcohol, Carbon Bisulphide, Chloroform, Ether, sp. gr. 0·720, and Glacial Acetic Acid.

Medicinal Properties.—Antiseptic, expectorant, hæmostatic, diuretic, anthelmintic. Useful in passive hæmorrhage from the various organs; 4 fl. drm. along with an equal quantity of Castor Oil is often successful in removing tapeworm. Antispasmodic in hysterical affections and in hiccough; it is said to dissolve gall-stones. In small doses (2 to 10 minims), and in large doses (3 to 4 fl. drm.), it does not usually tend to irritate the kidneys, but in doses of about 1 fl. drm. it is apt to do so. Contra-indicated in Bright's disease. Used as an **inhalation** in chronic bronchitis and other lung diseases; as an **enema** with Castor Oil for obstinate constipation, for flatulency and tympanitic distension of the bowels, and in thread-worm. Externally rubefacient and counter-irritant; employed as a **liniment** in chronic inflammatory pain and rheumatism, and as a fomentation in acute pain.

10-minim **capsules** every 2 or 3 hours, or in the form of an **emulsion** with equal parts of Spirit of Chloroform and Spirit of Nitrous Ether, have given good results in enteric fever, but should not be given in albuminuric vesical catarrh.—*B.M.J.* '04, ii. 1450. An **enema** of Soap and Water containing 1 oz. of Turpentine is of great value where there is flatulent distension of the colon.—*B.M.J.* '04, ii. 1452. Its use is stated to check bleeding sometimes, but to be more effectual in melæna than in hæmoptysis.—*B.M.J.* '05, i. 68. Its value as a styptic in typhoid has been questioned, but in the absence of a better remedy it should be used.—*B.M.J.* '05, i. 414.

In hæmoptysis in 10-minim doses in capsules.—*Edin. Med. Jour.* '05, p. 467.

In renal hydatids, 15 minims mixed with Liquor Potassæ, Mucilage and Liquorice, night and morning.—*L.* '05, ii. 601.

Flies and gnats are kept away by the odour of Turpentine.

Dose.—2 to 10 minims = 0·12 to 0·6 c.c.; as an anthelmintic, 3 to 4 fl. drm. = 10·6 to 14·2 c.c.

Prescribing Notes.—*Usually given in the form of* **mixture** *suspended with Mucilage or Powder of Gum Acacia. It may be given in Mistura Amygdalæ. It is also given in* **capsules.** 1 *fl. drm. of Mucilage, with diligent trituration, renders* ½ *fl. drm. of Oil of Turpentine emulsive with* 1 *fl. oz. of Distilled Water.*

30 *grains Powder of Gum Acacia rubbed first with* 1 *fl. drm. of Oil of Turpentine, then with* 1 *fl. drm. of Water, and lastly triturated whilst adding gradually* 1 *fl. oz. Distilled Water, makes a good emulsion.*

Official Preparations. — Linimentum Terebinthinæ and Linimentum Terebinthinæ Aceticum. Used in the preparation of Terebenum.

Not Official.—Confectio Terebinthinæ, Emulsum Olei Terebinthinæ, Enema Terebinthinæ, Linimentum Terebinthinæ, Unguentum Terebinthinæ, Vasolimentum Terebinthinæ, and Parogenum Terebinthinæ.

Antidotes. — Emetics, Epsom Salts, demulcent drinks, Morphine or Laudanum to relieve pain.

Foreign Pharmacopœias.—Official in Austr., Belg., Dutch, Fr., Ger., Hung., Ital., Jap., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Austr., Ger., Jap., Swiss and U.S. have also Rectificatum; Dutch has also Depuratum.

Tests.—Rectified Oil of Turpentine has a sp. gr. of 0·860 to 0·880; the *B.P.* does not give a sp. gr.; the *U.S.P.* states 0·860 to 0·870 at 25° C. (77° F.); the *P.G.* 0·860 to 0·870. It boils at about 156° C. (312·8° F.), which is the figure given in the *B.P.* The *P.G.* states that it distils completely between 155° and 162° C. (311° and 323·6° F.). The *B.P.* states that it should distil almost entirely below 180° C. (356° F.). This temperature is considered (*C.D.* '98, ii. 55) to be too high, boiling at about 155° C. (311° F.) and at least 80 p.c. distilling below 165° C. (329° F.) would have been better. The *U.S.P.* requires that the larger part of the Oil should pass over between 155° and 162° C. (311° and 323·6° F.). The optical rotation of the Oil may be either dextrogyrate or lævogyrate. French Oil of Turpentine is strongly lævorotatory (−20° to −40° in a tube of 100 mm. length). American Oil of Turpentine is dextrogyrate, the rotation usually varying from +9° to +14°. A 62 lb. quantity when fractionally distilled (*C.D.* '00, ii. 174) yielded up to 162·5° C. (324·5° F.) a distillate (91·2 p.c. of the whole) which was entirely dextrogyrate, and from 162·5° to 190° C. (324·5° to 374° F.) fractions (amounting to 8·52 p.c.) which increased in lævorotation with the boiling point, namely from −0·8° to −10·3°. Neither the *B.P.*, the *U.S.P.* nor the *P.G.* refers to the optical rotation. It is officially stated to be soluble in its own volume of Glacial Acetic Acid. This test has been shown (*P.J.* '02, i. 503) by the author and C. M. Caines to be practically of no value as a test for Oil of Turpentine, although useful as a test of the strength of Glacial Acetic Acid. An acid conforming strictly to the *B.P.* titration test (which requires a definite figure) cannot be expected to form a clear solution with all samples of Oil of Turpentine when mixed in equal volumes. Commercial samples of Glacial Acetic Acid which require more than the *B.P.* figure will mix readily without subsequent separation, and most of the commercial acids give a higher figure than the *B.P.* With such samples of Oil of Turpentine as had up to that time been examined the mixture of any of them in equal volumes with Glacial Acetic Acid [temperature 14·4° to 16·7° C. (58° to 62° F.)] became a delicate test for a strength of 99·5 p.c. acid or stronger. The test is also referred to under Acidum Aceticum Glaciale.

The more generally occurring impurities are Petroleum, Paraffin Oils, Rosin, Rosin Oil, Petroleum Benzin, Kerosene Oil or similar hydrocarbons. Petroleum, Paraffin Oils or Rosin, if present, may be detected by the residue test. Kerosene or Rosin Oil, if present, by the evaporation test. Petroleum Benzin, Kerosene and similar hydrocarbons by the Sulphuric Acid test, each of which tests is described in small type below. Some work done in the laboratory of the Canadian Inland Revenue Department (*C.D.* '02, i. 955) has resulted in the following definition of Oil of Turpentine, which must, however, be regarded as provisional, and subject to correction and amplification; it should be colourless, in thin layers, clear, but made decidedly opaque by shaking with 1·0 p.c. of Water and giving an opaque distillate of one-tenth volume which settles clear in a few hours. The peculiar and characteristic odour quite distinct from that of Gasolene, Rosin Oil, or Acetone. It has a sp. gr. between 0·860 and 0·880 (usually about 0·870). Samples which have been long exposed to the air have a higher density. The first 10 p.c. fraction has a sp. gr. of between 0·856 and 0·870 (usually about 0·860); the residual tenth should not exceed 0·900. The boiling point should lie between 154° and 158° C. (309·2° and 316·4° F.); nine-tenths should distil below 180° C. (356° F.). Fixed residue should not exceed 2 p.c., flash point about 32° C. (89·6° F.). The optical activity of the first fraction should increase in a plus direction by oxidation. The refractive index at 20° C. should lie between 1·4667 and 1·4722, that of the first fraction should not exceed 1·470. Moistened Starch Iodide paper should not become blue when suspended over Turpentine exposed to the air, free Bromine in solution should not be decolorised. Strong Sulphuric Acid should polymerise and char the sample at a boiling temperature, a rise of temperature should result on mixing with Sulphuric Acid.

Residue.—After distillation it should leave little or no residue, *B.P.*; 1 c.c. evaporated in a small dish on a water-bath should leave not more than a very slight residue, *U.S.P.*

Evaporation Test.—3 drops of Oil of Turpentine placed on a sheet of clean white filter paper and exposed to the air should evaporate entirely without leaving a permanent stain, *U.S.P.*

Potassium Hydroxide.—If 5 c.c. of the Oil be shaken with an equal volume of Potassium Hydroxide T.S., its colour should not become darker than a light straw-yellow upon standing 24 hours, *U.S.P.*

Sulphuric Acid.—If 5 c.c. of the Oil be placed in a small beaker and 20 c.c. of Sulphuric Acid be gradually added, with agitation, while the beaker is cooled by immersion in cold Water, and the contents, after cooling and renewed agitation, be transferred to a burette, graduated in tenths, the clear layer which forms after the dark mass has settled should not measure more than 0·35 c.c. (absence of Petroleum Benzin, Kerosene, or similar hydrocarbons), *U.S.P.*

Preparations.

LINIMENTUM TEREBINTHINÆ. LINIMENT OF TURPENTINE.

Dissolve 1 of Camphor in 13 of Oil of Turpentine and add them gradually to a mixture of 1½ of Soft Soap in 2 of Distilled Water, with constant trituration until a cream is produced, and add Distilled Water, *q.s.* to yield 20. (about 1 in 1½)

Official in U.S., Resin Cerate 55, Oil of Turpentine 35.

LINIMENTUM TEREBINTHINÆ ACETICUM. LINIMENT OF TURPENTINE AND ACETIC ACID.

Oil of Turpentine, 4; Glacial Acetic Acid (by weight), 1; Liniment of Camphor, 4. (about 1 in 2)

An imitation of St. John Long's celebrated Liniment.

Foreign Pharmacopœias.—Official in Swed. (Linimentum Terebinthinæ Acetatum), 9 Oil in 20; Swiss (Linimentum Terebinthinæ Compositum), about 3 Oil in 10.

Not Official.

CONFECTIO TEREBINTHINÆ.—Oil of Turpentine, 1 fl. oz.; Liquorice Root, in powder, 1 oz.; Clarified Honey, 2 oz. Rub the Oil of Turpentine with the Liquorice, add the Honey, and mix to a uniform consistence.—*B.P.* 1885.

This has been incorporated in the *B.P.C.*

EMULSUM OLEI TEREBINTHINÆ.—Rectified Oil of Turpentine, 15; Expressed Oil of Almond, 5; Syrup, 25; Acacia, 15; Water, *q.s.* to make 100.—*U.S.P.*

ENEMA TEREBINTHINÆ.—Oil of Turpentine, 1 fl. oz.; Mucilage of Starch, 15 fl. oz.—*B.P.* 1885.

Oil of Turpentine, ¼ to ½ fl. oz.; Mucilage of Starch, ½ to 1 pint.—*St. Thomas's.*

Oil of Turpentine 2; Mucilage of Starch 100.—*B.P.C.*

LINIMENTUM TEREBINTHINÆ.—*Rosin Cerate 65; Oil of Turpentine, by weight, 35. Dissolve the melted Cerate in the Oil of Turpentine and mix thoroughly.—*U.S.P.*

***Ceratum Resinæ.**—Rosin 35; Yellow Wax 15; Lard 50.—*U.S.P.*

UNGUENTUM TEREBINTHINÆ.—Oil of Turpentine, 1 fl. oz.; Resin, in coarse powder, 54 grains; Yellow Wax, ½ oz.; Prepared Lard, ½ oz.—*B.P.* 1885.

This has been incorporated in the *B.P.C.* as follows:—

Oil of Turpentine, by weight, 45; Resin, in coarse powder, 5; Yellow Beeswax 25, Lard 25.

Turpentine 1, Yellow Wax 1, Oil of Turpentine, by weight, 1.—*Ger.*

VASOLIMENTUM and **PAROGENUM TEREBINTHINÆ.** *See* p. 717.

Not Official.

THALLINÆ SULPHAS.

$(C_{10}H_{13}NO)_2.\ H_2SO_4,\ 2H_2O$, eq. 456·94.

A yellowish-white crystalline powder, with an odour resembling that of Coumarin, and an aromatic bitter taste.

The Sulphate of a synthetically prepared base derived from Chinoline, the full name of which is Tetrahydroparaquinanisol or Tetrahydroparamethyloxychinolin.

The free base is precipitated from solutions by alkalis, and from it are obtained the **Iodide** and other Iodinated compounds (*e.g.*, **Periodotetrahydroparamethyloxychinolinum**) which have been used in cancer.

Solubility.—1 in 7 of Water.

Medicinal Properties.—Antipyretic and antiseptic. Has been recommended internally in typhoid and other fevers.—*L.* '84, ii. 1018; *L.M.R.* '85, 456; *B.M.J.* '87, ii. 1438.

For gonorrhœa, an **injection** 2½ grains in 150 minims of Water; a **bougie** 2 grains in 40 grains of Cacao Butter.—*B.M.J.* '87, ii. 1438; *L.M.R.* '87, 162.

Adverse results in gonorrhœa.—*B.M.J.* '89, i. 1458.

Dose.—3 to 8 grains = 0·2 to 0·52 gramme.

Tests.—Thalline Sulphate dissolves readily in Water, forming a solution which possesses an acid reaction towards blue Litmus paper, and which becomes brown on exposure to the light. From this solution Iodine Solution throws down a brownish-red precipitate, Tannic Acid Solution a white precipitate, and Potassio-mercuric Iodide (Mayer's) Solution a yellow precipitate. The dilute aqueous solution affords on the addition of Ferric Chloride T.S. a green coloration, changing on standing to a deep red; this green coloration is destroyed by reducing agents. Ammonia Solution precipitates the free base as a white precipitate which is soluble in Ether. The aqueous solution affords with Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid. The salt should dissolve to form an almost colourless solution in Sulphuric Acid, indicating the absence of organic impurities. It should leave no weighable residue when heated with free access of air.

Cereoli (Antrophores) are medicated bougies containing a spiral spring wound with fine wire, and coated first with an insoluble layer of White Gelatin, and then with a diluted Mucilage. They are sometimes medicated throughout and sometimes only medicated externally.

No special medicament is specified in the *Ph. Ger.*, but they may be medicated in any desired manner.

Antrophores of the salt, described above, have been found useful in gonorrhœa.

Foreign Pharmacopœias.—Official in Ger.

THEOBROMATIS OLEUM.

OIL OF THEOBROMA.

B.P.Syn.—CACAO BUTTER.

A pale yellow or whitish-yellow fatty solid, having a distinctive odour of Cocoa and a bland agreeable taste. It is officially described as a concrete Oil, obtained by pressing the warm crushed seeds of *Theobroma Cacao*, L.; the *U.S.P.* describes it as a fixed Oil expressed from the roasted seeds of *Theobroma Cacao.* The *P.G.* describes it as the expressed fat from the seeds of *Theobroma Cacao* free from husk.

Official Preparations.—Contained in all the suppositories except Glycerin.

Not Official.—Theobromina, Theobrominæ Salicylas, Urocitral, Diuretin and Theocin, Theocin Sodium Acetate, Theobroma Solution Tablet Excipient, Ether-Alcohol Solution of Theobroma Excipient for Tablets.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Ger., Hung., Jap., Norw., Russ., Swed. and Swiss (Oleum Cacao); Fr. (Beurre de Cacao); Ital. (Burro di Cacao); Mex. (Manteca de Cacao); Port. (Oleo de Cacao); Span. (Aceite de Cacao); U.S. (Oleum Theobromæ).

It has been shown (*C.D.* '89, i. 800) that a large number of substances used in the form of suppositories caused the m.p. of the mixture to be several degrees higher than the base employed.

Cocoa-nut Stearin is sometimes a better substance than Cacao Butter for making suppositories. *See* p. 1154.

Tests.—Theobroma Oil softens at 30° to 34° C. (86° to 93·2° F.), and melts between 31·1° and 33·3° C. (88° and 92° F.); the *U.S.P.* gives the m.p. as 30° to 35° C. (86° to 95° F.); the *B.P.* gives 31·1° to 33·9° C. (88° to 93° F.). The m.p. has been shown to depend largely upon the method by which it is taken, the degree of heat to which the Oil is subjected previous to the determination, the diameter of bore of the capillary tube, and the time allowed to elapse between the melting of the Oil and the actual determination of its m.p. It requires about 24 hours in a capillary tube to regain its original m.p. Neither the *B.P.* nor the *P.G.* refers to the sp. gr. The *U.S.P.* gives the sp. gr. as 0·970 to 0·976 at 25° C. (77° F.). It usually possesses a sp. gr. of about 0·990, but authorities differ greatly respecting this constant. It possesses an Acid value of nil to 4·1 a Saponification value of 188 to 198. Neither the *B.P.*, the *U.S.P.*, nor the *P.G.* gives a figure for the Acid value. The *U.S.P.* gives 188 to 195 for the Saponification value; neither the *B.P.* nor the *P.G.* refers to this latter test. The Iodine value varies from 33 to 37, it is not referred to by the *B.P.* The *U.S.P.* states not less than 33 nor more than 38, the *P.G.* not less than 34 and not more than 38. 12 samples examined in the author's laboratory possessed Acid values ranging from nil to 4·1, with an average of 2·3; Saponification values ranging from 193·7 to 202·2, with an average of 197·2; and Iodine values ranging from 30·5 to 40·6, with an average of 36·1.

The more generally occurring impurities are Wax, Stearin, Tallow or Suet, or fixed Oils, *e.g.*, Sesame. These may be detected by their influence on the physical constants of the Oil and by their effect on the Acid, Saponification, and Iodine values. Wax, Stearin, Tallow or Suet and other fats may also be detected by the Ether test described in the small type below. The addition of Paraffin Wax will reduce the Saponification value.

Ether.—Dissolve 1 gramme of the Oil in 3 c.c. of Ether in a test-tube at 17° C. (62·6° F.) and place the tube (plunge it frequently, *U.S.P.*) in Water at 32° F. (0° C.). The liquid should not become turbid nor deposit a granular mass (white flakes, *U.S.P.*) in less than 3 minutes; and if the mixture after congealing be exposed to a temperature of 60° F. (15·5° C.), it should gradually become clear (absence of Wax, Stearin, Tallow, etc.), *B.P.* and *U.S.P.* the temperature given in the latter Pharmacopœia is 15° C. (59° F.); a solution of the Oil in 2 parts of Ether should not become turbid in the course of a day at 12° to 15° C. (53·6° to 59° F.), *P.G.*

Saponification.—When saponified by Alcoholic Potassium Hydroxide T.S. it should show a Saponification value of 188 to 195, *U.S.P.*

Iodine Absorption.—If 0·8 gramme of the Oil be dissolved in 10 c.c. of Chloroform in a 250 c.c. bottle or flask, and 25 c.c. of a mixture of equal volumes of Alcoholic Iodine T.S. and Alcoholic Mercuric Chloride T.S. added, and if, after standing for 4 hours protected from light, 20 c.c. of Potassium Iodide T.S. be added and the mixture diluted with 50 c.c. of Water, on titrating the excess of Iodine with Tenth-normal Volumetric Sodium Thiosulphate Solution an Iodine value of not less than 33 nor more than 38 should be obtained, *U.S.P.*; when 1 gramme of the Oil is dissolved in 15 c.c. of Chloroform and mixed with 25 c.c. Alcoholic Iodine Solution and Alcoholic Mercuric Chloride Solution and allowed to remain at rest protected from direct daylight for 4 hours and a solution of 1·5 grammes of Potassium Iodide in 100 c.c. of Water is then added, the mixture when titrated with Tenth-normal Volumetric Sodium Thiosulphate Solution shall show an absorption value of not less than 34 nor more than 38, *P.G.*

Not Official.

THEOBROMINA. Dimethyl-xanthine, $C_7H_8N_4O_2$, eq. 178·89.—White crystalline powder, appearing under the microscope as trimetic needles.

Solubility.—1 in 1700 of Water, 1 in 5000 of Alcohol (90 p.c.).

It is the alkaloid contained in the Cacao seeds and is isomeric with Theophylline and Paraxanthine. It is the lower homologue of Caffeine, and has a similar physiological action but stronger. It is much less soluble in Water than Caffeine, and acts the part of a weak Acid, forming compounds with alkalis. The seeds contain 1 to 2 p.c. of the alkaloid.

Diuretic, acting most efficiently in cases of cardiac disease.—*T.G.* '93, 767; *B.M.J.E.* '93, ii. 104. Considered in many respects superior to Diuretin.—*Pr.* li. 299. Diuresis may be prolonged by the subsequent administration of Digitalin ($\frac{1}{128}$ and $\frac{1}{64}$ grain).—*T.G.* '96, 330; *L.* '96, i. 205; ii. 1820; *P.J.* '95, ii. 391).

Not a genuine diuretic, but a cardiac stimulant; useful in arterio-sclerosis and aortic incompetence; but the action is temporary and palliative rather than curative.—*B.M.J.E.* '05, i. 4.

Dose.—5 to 10 grains = 0·32 to 0·65 gramme.

Official in Austr., Dutch, Fr., Span., Swed. and Swiss.

Tests.—Theobromine sublimes without decomposition or previous fusion at 290° C. (554° F.). *Fr. Codex* (1908) gives about 260° C. (500° F.). It dissolves very sparingly in Water. It dissolves in acids and is reprecipitated from solution by alkali, but is soluble in excess of Ammonia Solution or in solutions of Potassium or Sodium Hydroxide. An aqueous solution of Theobromine affords with Mercuric Chloride Solution a white crystalline precipitate. On the addition of Silver Nitrate Solution to a dilute aqueous solution of Theobromine or a Theobromine salt, silver-white needles are precipitated after a short time. When a small quantity of Theobromine is evaporated to dryness on a water-bath with an excess of Chlorine Water it leaves a reddish-brown residue, which assumes a purple-violet coloration when moistened with Ammonia Solution. Theobromine may be completely extracted from its solutions by shaking with Chloroform. When ignited with free access of air it should leave no weighable residue.

Theobrominæ Salicylas.—Theobromine Salicylate may be prepared by dissolving molecular proportions of Theobromine and Salicylic Acid in Water, evaporating to dryness and powdering the residue. The salt is stated to be more stable than the double salt, Sodium Theobromine Salicylate, which is decomposed even by Carbon Dioxide. Whilst admitting the advantage which it possesses with regard to its stability, an insurmountable obstacle is presented to its extended use on account of its insolubility.

Tests.—Theobromine Salicylate is only very slightly soluble in Water. The solution affords a violet coloration on the addition of Ferric Chloride T.S. The salt dissolves in Sodium Hydroxide Solution with the formation of a double Salicylate (Sodium Theobromine Salicylate).

UROCITRAL (Theobromine Sodium Citrate).—A white powder, soluble in warm Water. It is stated to contain 45 p.c. Theobromine. Introduced as a diuretic.—*B.M.J.* '05, i. 81.

DIURETIN. Sodium Theobromine Salicylate. $C_7H_7NaN_4O_2,C_7H_5O_3Na$, eq. 359·66.—A white, odourless, unstable powder.

It should be kept in well-stoppered glass bottles of a dark amber tint and exposed as little as possible to contact with the air, as it is liable to absorb Carbon Dioxide, decomposition simultaneously occurring.

A comparison of this drug with Agurin shows (*B.M.J.E.* '04, ii. 59) little fundamental difference of action, but only difference of degree.

Dose.—10 to 20 grains = 0·65 to 1·3 grammes, thrice daily.

Ph. Ger. maximum single dose, 1 gramme; maximum daily dose, 6 grammes.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Ger., Ital., Jap., Mex., Span., Swed. and Swiss.

Tests.—Sodium Theobromine Salicylate dissolves, when freshly prepared readily in Water, forming a colourless solution possessing an alkaline reaction towards red Litmus paper. A diluted aqueous solution when acidified with Acetic Acid yields on the addition of Ferric Chloride T.S. a violet coloration. When the aqueous solution is acidified with Hydrochloric Acid, Salicylic Acid as well as Theobromine is precipitated as a white precipitate, redissolving on the addition of Sodium Hydroxide Solution, but not on the addition of Ammonia Solution. 10 c.c. of a 1 in 5 w/w aqueous solution, from which the Theobromine and the Salicylic Acid have been precipitated by the addition of Hydrochloric Acid, and again redissolved by the addition of Sodium Hydroxide Solution (15 p.c.), when shaken with 10 c.c. of Chloroform and the Chloroform evaporated to dryness shall leave not more than 0·005 gramme of residue for each 1 gramme of Sodium Theobromine Salicylate represented in the original volume employed. A weighed quantity of 2 grammes of Sodium Theobromine Salicylate is dissolved by the aid of a gentle heat in a porcelain dish in 10 c.c. of Water, the solution is mixed with 5 c.c. or a sufficient quantity of Normal Volumetric Hydrochloric Acid Solution to render it slightly acid, and when mixed, 1 drop of a diluted Ammonia Solution (1 to 10) is added, and the very faintly alkaline mixture is allowed to stand for 3 hours at a temperature of from 15° to 20° C. (59° to 68° F.)

with intervals of frequent stirring, the resulting precipitate is filtered through a tared filter paper, previously dried at 100° C. (212° F.), washed twice with 10 c.c. of cold Water, dried till constant at 100° C. (212° F.) and when cooled weighed. The weight shall amount to at least 0·8 gramme, corresponding to at least 40 p.c. of Theobromine. 1 part by weight of this precipitate mixed with 100 parts of Chlorine Water and evaporated to dryness on a water-bath leaves a yellowish-red residue, which, on the addition of a little Ammonia Water, yields a beautiful purple-red coloration. The filtrate from this Theobromine precipitate contains the Salicylic Acid, which may be determined by acidulating with Hydrochloric Acid and shaking out with Chloroform. The chloroformic solution is washed with Water till free from mineral acid, sufficient Water added to form a separate layer, a few drops of Phenolphthalein Solution added and the mixture titrated with Tenth-normal Volumetric Sodium Hydroxide Solution; 1 c.c. of Tenth-normal Volumetric Sodium Hydroxide Solution corresponds to 0·013701 gramme of Salicylic Acid, it should contain about 38·5 p.c.

THEOCIN. Theophylline, Dimethylxanthin. $C_7H_8N_4O_2$, eq. 178·89.—Colourless, or white crystalline needles possessing a bitter taste. Theophylline is isomeric with Theobromine and Paraxanthin. It is stated to crystallise with 1 molecule of Water of crystallisation, which it loses at 110° C. (230° F.). Soluble 1 in 190 Water, 1 in 80 of Alcohol (90 p.c.), forming Potassium and Ammonium compounds which are readily soluble. It is a synthetic alkaloid, and is identical in composition with **Theophylline,** the alkaloid occurring with Theine or Caffeine in tea. It has been introduced as a diuretic. It has been used in kidney disorders with general dropsy, and appears to be most efficient when considerable œdema exists.—*B.M.J.E.* '03, ii. 39, 56; *A.J.P.* '03, 27; *C.D.* '03, i. 50; *P.J.* '03, i. 2. In *B.M.J.* '05, i. 1079 it is pointed out that it is a less powerful stimulant than Caffeine, but more active as a diuretic than Caffeine or Theobromine. A full dose may cause nausea or even vomiting, therefore the dose should not exceed 6 or 7 grains = 0·4 to 0·6 gramme.

Dose.—3 to 6 grains = 0·2 to 0·4 gramme.

It is also supplied in tablet form, each tablet containing 4 grains = 0·26 gramme.

Tests.—Theophylline melts at about 264° C. (507·2° F.). Synthetic Theocin melts at 268° C. (514·4° F.). It dissolves readily in warm Water, but is only sparingly soluble in cold Alcohol (90 p.c.); it is readily soluble in very dilute Ammonia Solution. When evaporated to dryness with Chlorine Water it yields a scarlet residue, changing to purple-red on the addition of a little Ammonia Solution. When ignited with free access of air it should leave no weighable residue. On the addition of Silver Nitrate to an aqueous solution of Theophylline an amorphous precipitate is produced.

THEOCIN SODIUM ACETATE. $C_7H_7NaN_4O_2,NaC_2H_3O_2$, eq. 282·23.—A white powder containing about 65 p.c. of anhydrous Theocin. It is soluble 1 in 6 of Water, 1 in 390 of Alcohol (90 p.c.), and insoluble in Ether. It is a double salt of Sodium Acetate, and 1 : 3 Dimethylxanthin Sodium. It was introduced as a diuretic and is indicated in all forms of dropsy in which the functions of the kidneys are not too seriously impaired by disease. It may be administered in cases of œdema resulting from renal disease, with the exception of cases of glomerulo-nephritis, in which active interference is contra-indicated. It should afford beneficial results in interstitial nephritis and in arterio-sclerosis of the kidneys, and in granular contracted kidney, and has been used with benefit for its vaso-dilator antispasmodic effects in angina pectoris.

Striking effect as a diuretic, but to be effective must be given with a cardiac tonic such as Digitalis; in 3 to 8-grain cachets every 4 hours; effects to be carefully watched, as it is apt to irritate the stomach.—*B.M.J.* '07, ii. 388.

Confirmation of the foregoing, in a severe case of ascites and œdema; no ill-effects.—*B.M.J.* '07, ii. 752.

Dose.—4 grains = 0·26 of a gramme.

Tests.—Theocin Sodium Acetate dissolves readily in Water, forming a solution which is slightly alkaline in reaction towards blue Litmus paper. It affords with Ferric Chloride T.S. a dark red coloration, and on boiling a brownish-red precipitate. When heated with Sulphuric Acid it evolves a strong characteristic acetous odour, when further warmed with a little Alcohol (90 p.c.) it evolves a characteristic odour of Ethyl Acetate (Acetic Ether). When ignited with free access of air it leaves a residue which when dissolved in Water possesses a strong alkaline reaction towards red Litmus paper, and effervesces on the addition of diluted Hydrochloric Acid; it yields the tests distinctive of Sodium given under that heading.

THEOBROMA SOLUTION TABLET EXCIPIENT.—Oil of Theobroma, 25; Hard Soap, 5; Powdered Tragacanth, 0 5; Benzoic Acid, 0·25; Water, to 100. Dissolve the Soap in 25 parts of Water by heat, add the hot solution to the melted Theobroma and mix by whisking or agitation, shake in the Tragacanth, add the rest of the Benzoic Acid, then the rest of the Water. Gum Acacia may be used in place of Soap without making any appreciable difference in the general utility of the product, in either case it should be a thick, smooth, white cream, free from lumps.—*C.D.* '03, ii. 231.

This has been incorporated in the *B.P.C.* under the title Emulsio Theobromatis, using 3 of Hard Soap in the place of 5 given originally.

ETHER-ALCOHOL SOLUTION OF THEOBROMA EXCIPIENT FOR TABLETS.—Oil of Theobroma, 1; Ether, to 6 fl. oz.—Dissolve, and add an equal volume of Rectified Spirit as required for use.—*C.D.* '03, ii. 231.

This has been incorporated in the *B.P.C.* under the title **Liquor Theobromatis Æthereus.**

For general directions for making Compressed Tablets *see* p. 1190.

THUS AMERICANUM.

FRANKINCENSE.

A softish, pale, opaque solid, possessing an agreeable terebinthinate odour. On keeping it hardens and forms a translucent brittle solid. It is officially described as the concrete oleo-resin which is scraped off the trunks of *Pinus palustris*, Mill., and *Pinus Tæda*, L.

From the Southern States of North America.

Solubility.—Almost wholly soluble 1 in 1 of Alcohol (90 p.c.); entirely 4 in 3 of Ether.

Medicinal Properties.—Used externally for the same purposes as Resin.

Official Preparation.—Used in the preparation of Emplastrum Picis.

THYMOL.

THYMOL.

$C_{10}H_{13}(OH)$, eq. 148·98.

Large, colourless, translucent, oblique, rhombic prisms, having a distinctive somewhat agreeable, Thyme-like odour, and burning, aromatic taste. It is a crystalline Phenol contained in the volatile Oils of *Thymus vulgaris*, L., *Monarda punctata*, L., and *Carum Copticum*, Benth. and Hook. f.; but is chiefly obtained commercially from the last named. Thymol is described by the *U.S.P.* as a Phenol occurring in the volatile Oil of *Thymus vulgaris*, L., and in some other volatile Oils.

It should be kept in well-closed vessels of a dark amber tint.

Solubility.—1 in 1500 of Water; 1 in 190 of Glycerin; 8 in 3 of Alcohol (90 p.c.) or Ether; 8 in 5 of Chloroform; 1 in 6 of Petroleum Spirit; 1 in 3 of Oil of Turpentine; 1 in 2 of Olive Oil; 4 in 3 of Glacial Acetic Acid; 1 in 6 of Solution of Potassium Hydroxide.

The above figures for solubility have been incorporated in the *B.P.C.* The expressions peculiar to the *Companion*, 8 in 3 of Alcohol (90 p.c.) or Ether, 8 in 5 of Chloroform, and 4 in 3 of Glacial Acetic Acid being also used.

Medicinal Properties.—A saturated **solution** in Water is a very powerful antiseptic; used as an intestinal antiseptic in diarrhœa and typhoid. As an **ointment** or **soap** in parasitic skin diseases. As an **inhalation** in laryngitis and bronchial affections; and for many other conditions in which Carbolic Acid is useful. It is a very powerful deodorant, and is a local anæsthetic.

In ankylostomiasis, no vermifuge is comparable to it. 10 to 60 grains for fairly robust patients, not more than 10 grains for those who are very ill, or much advanced in years.—*B.M.J.* '03, i. 720.

Recommended in ankylostomiasis (*Pr.* lxxiii. 685), in 2 or 3 doses of 2 grammes = 30 grains, at 2 hours' interval, after a little Coffee or Broth in the early morning, and after a Calomel and Senna purge. 6 grammes is the limit advised, and a dose of Epsom salts should be given 2 hours after the last dose to eliminate the Thymol from the intestinal tract. Children, ¼ to ½ the full dose. The administration of any of the usual solvents of Thymol must be avoided.

In ankylostomiasis should be given (*L.* '05, i. 860) in large and repeated doses, ½ drm. every 2 hours for several doses.

Usually employed as a deodorant, which property it possesses to a marked degree; its **aqueous solution** is very useful in a night commode, and an extremely small quantity of it will keep urine, when it is required to make a 24 hours' collection for analytical purposes.

Dose.—½ to 2 grains = 0·032 to 0·13 gramme.

Not Official.—Glycerinum Thymol Alkalinum, Glycerinum Thymol Compositum, Liquor Antisepticus, Liquor Thymol, Thymol Antiseptic Dressings, Unguentum Thymol, Vapor Thymol, Oleum Thymi, Aristol, Carvacrol Iodide and Thymol Carbonate.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Russ., Span., Swed., Swiss and U.S.

Span. and U.S. have also Thymolis Iodidum.

Tests.—Thymol melts at about 50° C. (122° F.); the *U.S.P.* and the *P.G.* give 50° to 51° C. (122° to 123·8° F.); the *B.P.* does not include a m.p. The sp. gr. is given by the *U.S.P.* as 1·030 at 25° C. (77° F.). The *U.S.P.* also states that when liquefied by fusion it is lighter than Water. The *B.P.* states that the crystals sink in cold Water, but at a temperature of 43·3° to 51·7° C. (110° to 125° F.) the crystals melt and rise to the surface. The *P.G.* states that the crystals sink in Water, but that melted Thymol floats on the surface of Water. Neither the *B.P.* nor the *U.S.P.* refers to the boiling point. It boils at 232° C. (449·6° F.). The *P.G.* states that it boils at 228° to 230° C. (442·4° to 446° F.). When mixed with an equal proportion of Camphor, Menthol or Chloral Hydrate it liquefies. It dissolves only sparingly in Water, but readily in Alcohol (90 p.c.), the alcoholic solution being optically inactive. The *B.P.* states that a solution of Thymol in half its bulk of Glacial Acetic Acid warmed with an equal volume of Sulphuric Acid yields a reddish-violet colour. The *U.S.P.* and the *P.G.* state that a very small crystal of Thymol dissolved in 1 c.c. of Glacial Acetic Acid yields a liquid which on the addition of 6 drops of Sulphuric Acid and 1 drop of Nitric Acid yields a deep bluish-green colour when viewed by reflected light. It dissolves in 4 parts by weight of Sulphuric Acid at the ordinary temperature, forming a yellowish liquid which on gentle warming assumes a beautiful rose-red coloration. If this solution be poured into 10 volumes of Water, and the mixture allowed to stand with frequent intervals of shaking at a temperature of 35° to 40° C. (95° to 104° F.) in contact with an excess of Lead Carbonate, and the liquid be then filtered it yields a filtrate which on the addition of a little Ferric Chloride Solution assumes a beautiful violet colour. A distinctive reaction for Thymol and also for Carvacrol is the reddish-violet coloration produced on heating a small quantity of either with 0·1 of a gramme of Potassium Hydroxide and 20 drops of Chloroform. Thymol requires the addition of a few drops of Alcohol to effect solution before the colour is produced. The *U.S.P.* describes a somewhat similar test, 1 gramme of Thymol heated in a test-tube in a water-bath with 5 c.c. of Sodium Hydroxide Solution (10 p.c.) affords a clear colourless solution possessing a very slight reddish tint, becoming darker on standing, but without the separation of oily drops. On the addition of a few drops of Chloroform to this liquid it affords when agitated a violet coloration.

The more generally occurring impurities are Phenol, non-volatile organic impurities, and inorganic impurities. Phenol may be detected by the Ferric Chloride and the Bromine tests described in small type below. Non-volatile organic impurities and inorganic impurities by the residue test also described below.

Residue.—It is completely volatilised at the temperature of a water-bath, *B.P.* and *U.S.P.*; 0·1 gramme volatilised on a water-bath should not leave a weighable residue, *P.G.*

Ferric Chloride.—An alcoholic solution of Thymol should not be coloured by T.S. of Ferric Chloride, *U.S.P.*; an aqueous solution should be neutral and should not be coloured violet, *P.G.*

Bromine.—In an aqueous solution of Thymol, Bromine Water should produce a milky turbidity but not a crystalline precipitate, *P.G.*

Not Official.

GLYCERINUM THYMOL ALKALINUM.—Sodium Bicarbonate, 100 grains; Sodium Biborate, 200 grains; Sodium Benzoate, 80 grains; Sodium Salicylate, 40 grains; Menthol, 2 grains; Pumilio Pine Oil, 4 minims; Wintergreen Oil, 2 minims; Thymol, 4 grains; Eucalyptol, 12 minims; Alcohol (90 p.c.) 4 fl. drm.; Glycerin, 2 fl. oz.; Solution of Carmine, 40 minims; Distilled Water, *q.s.* to produce 20 fl. oz. Dissolve the salts in the Water, add the Glycerin and Solution of Carmine, then add the Oils previously dissolved in the Alcohol, and filter.—*Bournemouth Formulary.*

This has been incorporated in the *B.P.C.* under the title **Glycerinum Thymol Compositum.** *Syn.* Glycerinum Thymol Alkalinum, as follows:—Sodium Bicarbonate, 1; Sodium Biborate, 2; Sodium Benzoate, 0·75; Sodium Salicylate, 0·50; Menthol, 0·03; Oil of Pine, 0·05; Oil of Wintergreen, 0·03; Thymol, 0·05; Eucalyptol, 0·13; Alcohol (90 p.c.), 2·50; Glycerin, 10; Solution of Carmine, 0·50; Distilled Water, *q.s.* to produce 100.

LIQUOR ANTISEPTICUS.—Boric Acid, 2; Benzoic Acid, 0·1; Thymol, 0·1; Eucalyptol, 0·025; Oil of Peppermint, 0·05; Oil of Gaultheria, 0·025; Oil of Thyme, 0·01; Alcohol (95 p.c.), 25; Purified Talc, 2; Water, *q.s.* to make 100. Dissolve the Boric Acid in 70 of Water and the Benzoic Acid in 15 of Alcohol, pour the aqueous solution into the alcoholic solution. Then dissolve in a mortar the Thymol in the Oils; incorporate thoroughly the Purified Talc, and add with constant trituration the solution first prepared. Allow the mixture to stand for 48 hours with occasional agitation, filter, add 10 of Alcohol to the clear filtrate, and sufficient Water to make 100.—*U.S.P.*

This has been incorporated in the *B.P.C.* under the title of **Liquor Thymolis Compositus** with *synonym* Liquor Antisepticus, using 26·50 of Alcohol (90 p.c.) in place of 25 of Alcohol (95 p.c.).

Liquor Antisepticus (Volckmann).—Thymol, 1; Alcohol (90 p.c.), 10; Glycerin, 20; Distilled Water, 100.

LIQUOR THYMOL.—Thymol, 1; Alcohol (90 p.c), 100. This solution is very useful, as it may be diluted to any extent with Water without precipitation. Half a pint diluted to a gallon is about the same strength as a saturated aqueous solution.

THYMOL ANTISEPTIC DRESSINGS.—**Gauze,** 5 p.c., and **Wool,** 5 p.c.

UNGUENTUM THYMOL.—Thymol, 20 grains; Soft Paraffin, 1 oz.—*London.*

VAPOR THYMOL.—Thymol, 6 grains; Alcohol (90 p.c.), 60 minims; Light Magnesium Carbonate, 3 grains; Water, to 1 fl. oz.—*Throat.*

A teaspoonful in a pint of Water at 140° F. for each **inhalation.**

OLEUM THYMI.—The rectified Oil forms an almost colourless or yellow oily liquid, having a pleasant aromatic Thyme-like odour and a sharp aromatic taste. The crude Oil is a reddish or reddish-brown oily liquid possessing similar characteristics of taste and odour. It is the Oil distilled, principally from the fresh flowering herb, *Thymus vulgaris.* Should contain from 25 to 35 p.c. of Phenols (Thymol and Carvacrol). The rectified Oil soon darkens in colour on exposure to air and light, and should be kept in well-stoppered bottles of a dark amber tint.

The Oil is not official in the *B.P.* The *U.S.P.* and the *P.G.* describe it as the volatile Oil distilled from the leaves and flowering tops of *Thymus vulgaris*; both Pharmacopœias require it to contain not less than 20 p.c. by volume of Phenols.

Foreign Pharmacopœias.—Official in Fr., Ger., Jap., Russ., Span., Swiss and U.S.

Tests.—Oil of Thyme has a sp. gr. of 0·900 to 0·930; the *U.S.P.* states 0·900 to 0·930 at 25° C. (77° F.); the *P.G.* 0·900. It is slightly lævogyrate, the optical rotation being from −1° to −3°. The *U.S.P.* states not more than −3° in a 100 mm. tube at a temperature of 25° C. (77° F.). The *P.G.* does not give the optical rotation. It dissolves in half its volume of Alcohol (94·9 p.c.) and in 1 to 2 volumes of Alcohol (80 p.c.). The *P.G.* states that it is soluble in 3 parts by weight of a mixture of 100 parts by volume of Alcohol (90 p.c.) and 14 parts by volume of Water. The alcoholic solution yields with a drop of Ferric Chloride T.S. a greenish-brown coloration, changing to reddish. It is required by the *U.S.P.* to contain not less than 20 p.c. by volume of Phenol, as quantitatively determined by measuring the volume of unabsorbed non-Phenol Oil remaining after treating the Oil with a 1 in 20 Sodium Hydroxide. A measured quantity of 10 c.c. of the Oil introduced into a burette having a capacity of 50 c.c. and containing 40 c.c. of a 1 in 20 Sodium Hydroxide Solution; the burette is well corked and the mixture shaken thoroughly, and then set aside for from 12 to 24 hours, the drops of Oil adherent to the side of the burette are detached by gentle tapping and rotation. When the alkaline liquid has become clear, the volume of unabsorbed Oil is recorded and subtracted from the original amount of Oil taken, the difference multiplied by 10 indicates the percentage of Phenols in the Oil; the unabsorbed Oil should not measure more than 8 c.c.

The *P.G.* adopts a corresponding limit, but shakes a measured quantity of 5 c.c. of the Oil with 30 c.c. of a mixture of 10 c.c. of Sodium Hydroxide Solution (15 p.c. w/w), and 20 c.c. of Water in a graduated cylinder, and allows the mixture to stand until the alkaline solution has become clear; the volume of unabsorbed Oil is then read off. It should be subtracted from the volume of Oil used for the determination (5 c.c.), and the result multiplied by 20 which indicates the percentage by volume of Phenols present in the Oil. The Oil when shaken with 10 times its volume of hot Water, cooled, and the liquid filtered through a wet filter yields a filtrate which is not coloured bluish or violet by Ferric Chloride T.S., indicating the absence of Phenol.

A comparison of commercial Thyme and Origanum Oils is given (*P.J.* '08, i. 803); French Thyme Oil, from *Thymus vulgaris*, had a sp. gr. of 0·905 to 0·920 and contained from 18 to 45 p.c. of Phenol; Wild Thyme Oil, from *Thymus serpyllum* had a sp. gr. of from 0·890 to 0·905, contained practically no Phenols; a Spanish Thyme Oil, of doubtful origin, had a sp. gr. of from 0·930 to 0·950, and contained 50 to 70 p.c. of Phenols; Trieste Oil from *Origanum hirtum* had a sp. gr. of from 0·940 to 0·980 and contained from 60 to 85 p.c. of Phenols; Smyrna Oil from *Origanum Smyrnæum* had a sp. gr. of 0·915 to 0·945, and contained from 25 to 60 p.c. of Phenols; Cyprus Oil from *Origanum majoranoides* had a sp. gr. of 0·961 to 0·967, contained 78 to 84 p.c. of Phenols, whilst a sample of Sicilian Oil had a sp. gr. of 0·920, and contained 44 p.c. of Phenols.

ARISTOL (Thymol Iodide, $C_{20}H_{24}O_2I_2$, eq. 545·76).—A bright yellowish or brownish-yellow or reddish-yellow bulky powder with a slight aromatic odour somewhat resembling Iodoform. It is insoluble in Water and Glycerin, slightly soluble in Alcohol, readily soluble in Ether and Chloroform. It has been introduced as a substitute for Iodoform. Used successfully as a 10 p.c. Ointment, or by dusting the powder on ulcerating lupus, tinea, and syphilitic ulcers; in psoriasis and eczema a 10 p.c. solution in flexible collodion; as a pessary in ulceration of vagina or cervix.

It has been used as a dressing for burns.

Tests.—Aristol when heated is decomposed. When heated with concentrated Sulphuric Acid it is decomposed with the separation of Iodine. 1 decigramme when shaken with 20 c.c. of Water and filtered yields a filtrate which should not become more than opalescent on the addition of Nitric Acid and Silver Nitrate Solution. 5 decigrammes shaken with 10 c.c. of Water and filtered should afford a filtrate which should impart no blue colour to red Litmus paper, indicating the absence of alkalis. 5 decigrammes shaken with 10 c.c. of Water and the mixture filtered affords a filtrate which should not be coloured blue upon the addition of Starch Solution, indicating the absence of free Iodine. 0·5 of a gramme when ignited with free access of air should leave not more than 0·015 gramme of residue.

CARVACROL IODIDE.—A light yellow or reddish-brown powder, insoluble in Water and Alcohol, but soluble in Ether and in Chloroform, produced by the action of Iodine and Potassium Iodide on Carvacrol in solution.

As a germicide it is stated to be 5 times more powerful than Iodoform, and being more bulky is better adapted as a dusting powder. The substance which was prepared for many years by the author at the suggestion of Dr. Mortimer Granville is of a reddish-brown colour, but more recently a substance of a light yellow colour has been used in Germany as a substitute for Iodoform.

Iodocrol, a fancy name applied to the latter product.

THYMOL CARBONATE (Tyratol).—Forms a tasteless white powder. Recommended as a powerful vermifuge.—*C.D.* '01, ii. 344.

Arhovin, a product of Diphenylamine and Thymolbenzoic ester, in gonorrhœa (*B.M.J.E.* '07, i. 95); an ideal preparation in gonorrhœa, 1 to 2 p.c. solution in Olive Oil rapidly increased to 3 or 5 p.c.—*B.M.J.E.* '06, ii. 87.

THYROIDEUM SICCUM.

DRY THYROID.

A pale buff-coloured to light brown, somewhat hygroscopic, amorphous powder, possessing a peculiar distinctive meat-like odour. The powdered desiccated Thyroid gland is official in the *U.S.P.*, but not in the *P.G.* It is described as the Thyroid glands of the sheep (Ovis aries), Linné, freed from fat, cleaned, dried and powdered. The *B.P.* requires the healthy gland to be used, and after drying below 40° C. (104° F.) extracts the fat with Petroleum Ether; but it is not definitely stated in the *U.S.P.* monograph that the healthy gland should be employed, of course this would naturally be inferred; the *U.S.P.* states freed from fat, but does not indicate a method. 1 part of the desiccated Thyroid gland is stated to represent approximately 5 parts of the fresh gland.

Medicinal Properties.—Has been used with success in myxœdema and certain forms of insanity, obesity, goître and cretinism, psoriasis and chronic scaly skin diseases. Thyroid should never be given in exophthalmic goître.

Preparations.—*B.M.J.* '92, ii. 1384, 1459; *L.* '93, i. 273, 396; in goître—*L.* '95, ii. 169; *B.M.J.* '95, ii. 75; '96, i. 48; in cancer—*L.* '96, ii. 106, 162; in cretinism—*L.* '96, i. 853, 1446; '97, ii. 853; '02, i. 1565; *B.M.J.* '01, i. 1143; '02, i. 1259; in lupus—*B.M.J.* '94, i. 786; '96, ii. 1200; *L.* '96, ii. 41, 470; in psoriasis—*B.M.J.* '94, i. 186, 617; '95, i. 697; *L.* '95, i. 813; *B.M.J.E.* '95, ii. 35; ichthyosis—*B.M.J.* '95, i. 696; in pityriasis rubra—*B.M.J.* '95, i. 695; in rickets—*B.M.J.E.* '02, i. 40.

Oophorectomy combined with administration of thyroid has been recommended in inoperable carcinoma of the breast, in small doses, gradually increased to 15 grains daily.—*B.M.J.* '00, ii. 1161; '01, ii. 1145, 1439; '02, i. 508; *L.* '01, ii. 388, 966, 967; '02, i. 888; *T.G.* '99, 609.

12 p.c. of recoveries in cases of insanity which were not hopeless, but intractable by ordinary methods. It appears to be more efficacious in women than in men, and the best all-round results were connected with the insanity of child-bearing.—*B.M.J.* '00, ii. 818.

It powerfully affects the metabolism generally of the body cells, raising their tone and improving their vigour.—*B.M.J.* '01, ii. 1147.

A useful general *résumé* of our knowledge of the Thyroid Extract, forming portion of the Hunterian Oration on Organo-Therapeutics.—*L.* '02, i. 1091.

In puerperal eclampsia, 5 grains thrice daily for 6 days, followed by 5 grains every 3 hours for 17 days, an interval of 14 days, and then doses of 5 grains daily.—*B.M.J.* '02, i. 1214; *L.* '02, i, 824; ii. 459; '03, i. 307.

10 grains given in each case on admission, and 5 grains every 4 hours afterwards in puerperal eclampsia.—*L.* '04, i. 1057; *B.M.J.* '04, i. 895.

In psoriasis.—Initial dose should not exceed 5 grains once daily, and increment should be gradual and spread over 2 or 3 weeks, and should seldom exceed 15 grains a day, not giving more to patients who are not daily under observation.—*B.M.J.* '03, i. 656; *L.* '03, i. 785.

In glycosuria, 1½ grains in tablet form 3 times a day.—*L.* '03, ii. 187.

In a number of cases of confirmed epilepsy, in which preparations of the Thyroid gland were given over considerable periods, no appreciable result was detected either in the mental condition or in the frequency or severity of the fits.—*L.* '05, i. 710. It has a marked alterative influence in certain chronic affections of the skin. Its effect in cases of psoriasis is so evanescent as to make it of little practical value. It is of use, however, in quickening the healing of small idolent ulcers.—*B.M.J.* '05, i. 700.

Dose.—3 to 10 grains = 0·2 to 0·65 gramme.

Official Preparation. Liquor Thyroidei.

Not Official.—Elixir Thyroidei, Liquor Thyroidei, Tablets of Thyroid Gland, Iodothyrin and Thyroglandin.

Foreign Pharmacopœias.—Official in Belg. (Thyroidea) and U.S.

Tests.—Dried Thyroid is not officially required to answer any definite chemical tests. The *U.S.P.* requires that 1 gramme of the desiccated Thyroid gland when mixed with an equal weight of pure Sodium Hydroxide and carefully fused in a silver dish until a white mass remains, Potassium Nitrate being added during the fusing to assist oxidation, yields, when the fused residue is dissolved in a small quantity of Water, a solution which, treated with 2 grammes of Sodium Nitrite acidified with concentrated Nitric Acid and shaken with 5 c.c. of Chloroform, imparts to the chloroformic liquid a decided pink to violet coloration. A cold extract of desiccated Thyroid glands treated with 2 grammes of Sodium Nitrite and acidified with strong Nitric Acid should not give the Iodine test on shaking with Chloroform. A preferable method of performing the test is that suggested (*Y.B.P.* 1883, 530; *P.J.* '98, ii. 546), and Chloroform is not found to be a suitable solvent for the Iodine, the sample is never burnt to ash, but always into Charcoal in the presence of a slight excess of Sodium Hydroxide; the risk of loss of Iodine by adding Potassium Nitrate to promote oxidation never being incurred. To liberate the Iodine from the aqueous solution of the charred residue a few drops (1 to 3) of Nitro-Sulphuric Acid are used, the Nitro-Sulphuric Acid being prepared by treating Starch with Nitric Acid and passing the Nitrous fumes into the Sulphuric Acid (1·043 sp. gr.) to saturation. Carbon Bisulphide is employed as a solvent for the liberated Iodine, and the tests are performed in large tubes of even bore and compared with standard solution of Potassium Iodide treated in the same manner. It is claimed by this method $\frac{1}{250000}$ part of Iodine is easily detected and measured, and up to $\frac{1}{100000}$ part the estimation is very accurate. When incinerated the *U.S.P.* states that desiccated Thyroid glands should yield not more than 6 p.c. of ash.

Preparation.

LIQUOR THYROIDEI. Thyroid Solution.

A liquid prepared from the fresh and healthy Thyroid gland of the sheep.

This preparation does not appear to be a success pharmaceutically, as it readily undergoes decomposition. The menstruum is equal parts of Glycerin and Distilled Water, containing about 1 of Phenol in 400 of the total volume.

Glycerin is stated not to dissolve out Thyroiodin.—*P.J.* '98, ii. 167; *C.D.* '98, ii. 288. This statement has been contradicted.—*P.J.* '98, ii. 482. But reaffirmed on strong evidence.—*P.J.* '98, ii. 546.

Tests.—When evaporated to dryness, the residue moistened with Sodium Hydroxide Solution and fused, the charred residue extracted with Water, the excess of alkali neutralised and the solution mixed with 1 to 3 drops of Nitro-Sulphuric Acid, as described under Thyroideum Siccum, and shaken with a few c.c. of Carbon Bisulphide a decided violet coloration should be imparted to the Carbon Bisulphide Solution. No test for the presence of Iodine compounds is given in the *B.P.*

Not Official.

ELIXIR THYROIDEI (*Squire*).—A clear, aromatic, reddish liquid, containing the entire active principles of the Thyroid gland of the sheep. Each fl. drm. is equal to 1½ grains of dry Thyroid.

Dose.—1 to 2 fl. drm. = 3·6 to 7·2 c.c.

ELIXIR THYROIDEI (*Armour*).—Prepared with a Glycerin menstruum, 1 fl. oz. equivalent to 1 entire sheep's Thyroid gland.

Dose.—30 to 60 minims = 1·8 to 3·6 c.c.

LIQUOR THYROIDEI (*Squire*).—A transparent, pale reddish liquid, containing the entire active principles of the gland. Each fl. drm. is equal to 6 grains of dry Thyroid.

Dose.—10 to 60 minims = 0·6 to 3·6 c.c.

TABLETS OF THYROID GLAND.—Each tablet containing the equivalent of 1½, 2½ 5 or 10 grains of the entire substance of the Thyroid gland. **Tablets,** each containing 5 grains, equivalent to 2 grains of the desiccated substance.

IODOTHYRIN (Thyroiodin).—An amorphous light brown powder, insoluble in Water, soluble in Alcohol. Dissolved by alkalis and again precipitated on the addition of an acid. It is an organic compound of Iodine, constituting the active principle of the Thyroid gland, free from albuminoids, adjusted with Sugar of Milk to equal in strength the active substance of the fresh gland, and standardised to contain 0·3 p.c. of Iodine. Usually standardised by dilution with Milk Sugar, to contain a definite percentage of Iodine.—*L.* '96, i. 592, 666, 941; '97, ii. 855; *B.M.J.* '96, i. 722; *B.M.J.E.* '96, ii. 59; '97, ii. 8; *P.J.* '96, i. 161; ii. 215, 388; '97, i. 287.

Tests.—Iodothyrin when moistened with Sodium Hydroxide Solution and carefully charred leaves a carbonaceous residue which when dissolved in Water, the alkali neutralised with diluted acid and the solution treated with Nitro-Sulphuric Acid, as described under Thyroideum Siccum, yields when shaken with Carbon Bisulphide Solution a decided violet coloration.

THYROGLANDIN.—A light yellowish-brown or brown, somewhat hygroscopic, amorphous powder, which is stated to consist of the entire active constituents of the gland. It contains the Iodoglobulin obtained from the fresh glands by simple treatment with Water, together with the total amount of Iodothyrin obtained by subsequent treatment of the residual glands with 1 p.c. Soda Solution and exact neutralisation with Hydrochloric Acid.—*P.J.* '98, ii. 167, 654; *C.D.* '98, ii. 288, 970; *B.M.J.* '98, ii. 79.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

Tests.—Thyroglandin when moistened with Sodium Hydroxide Solution and carefully charred leaves a carbonaceous residue which when dissolved in Water, the alkali neutralised with diluted acid and the solution treated with Nitro-Sulphuric Acid, as described under Thyroideum Siccum, yields when shaken with Carbon Bisulphide Solution a decided violet coloration.

Thyrodectin is stated (*B.M.J.* '07, i. 756) to be the dried blood of animals from which the Thyroid glands have been removed. A reddish-brown powder, put up in capsules containing 5 grains each.

TINCTURÆ.

TINCTURES.

Most of the Tinctures of the British Pharmacopœia are directed to be made either by 'maceration' or by 'percolation'; the number in each class is nearly equal, but if anything the latter predominate; about a dozen are made by simple solution, or mixing the ingredients.

The official directions for maceration and percolation are much the same as in 1864; for percolation the ingredients are macerated with a portion of the menstruum for 48 hours, and then percolated with more of the same, the marc is pressed and the whole yield of liquid made up to the required volume; for maceration, the ingredients are mixed with the required quantity of menstruum, and after 7 days strained, pressed, and if necessary the liquid is filtered; in 1864, 1867, and 1885, the macerated tinctures were finally made up to a volume, but in 1898 this was omitted.

The degrees of comminution appeared first in the 1885 edition.

The following *B.P.* Tinctures are standardised:—Cinchona, Jalap, and Opium; the Tinctures of Belladonna and Nux Vomica are made from standardised Fluid Extracts; Ammoniated Tincture of Opium and Compound Tincture of Camphor are made from standardised Tincture of Opium; Compound Tincture of Cinchona from standardised Tincture of Cinchona.

The strengths of the various Tinctures have been adjusted so as to have a dosage of 5 to 15 minims for the potent Tinctures, and 30 to 60 for the less potent.

With regard to the Tinctures contained in the Continental Pharmacopœias a comparison is given under each separate Tincture in the *Companion* paragraphs commencing Foreign Pharmacopœias. The Potent Tinctures given therein are compared with the standards adopted by the *Brussels Conference* and the alcoholic strength of the Tincture is also given.

The tabulated comparison of the chief standardised potent preparations of the British, United States, German and French Pharmacopœias given at the commencement of this book shows at a glance the alkaloidal strengths and the standards for the Tinctures official in the four Pharmacopœias with which the present volume is chiefly concerned, and which are probably of the most material interest to English readers.

The Tinctures or Teintures Alcooliques of the *Fr. Codex* (1908) are liquid medicaments resulting from the solvent action of Alcohol on various substances, they consist of 'simple' or 'compound' Tinctures, simple being prepared with the single substance, the compound where several substances are used in the preparation. They are prepared by maceration or percolation, Alcohol 60 p.c., 70 p.c., 80 p.c., or 95 p.c., being employed according to the nature of the drug to be exhausted. All simple tinctures of heroic drugs, that is to say, of very active drugs are prepared by percolation with Alcohol (70 p.c.), and in such a manner that the weight of the resulting tincture is equal to ten times the weight of the substance employed, in accordance with the *Brussels Convention*, 1902.

Prescribing Notes.—*Most of the Tinctures mix readily with Water, but resinous Tinctures under similar circumstances require the addition of Mucilage of Gum Acacia, which is the best all-round emulsifying agent for this purpose. It gives good results with all the Tinctures except Compound Tincture of Benzoin, which is very difficult to diffuse in Water; neither Mucilage of Gum Acacia nor Mucilage of Tragacanth, by itself, gives a satisfactory emulsion with this Tincture; the best effect is obtained by the use of Compound Tragacanth Powder*, 60 *grains of which will diffuse* 3 *fl. drm. of Compound Tincture of Benzoin, in* 3 *fl. oz. of Water.*

The quantity of Mucilage required for resinous Tinctures will depend upon the proportion of Tincture to the Water or other aqueous fluid; 1 *fl. drm. of Mucilage of Gum Acacia is sufficient for* 1 *fl. drm. of the following Tinctures in* 1 *fl. oz. of Water:—Benzoin, Cubebs, Ammoniated Guaiacum, or Tolu. The following Tinctures require only about half this quantity:—Asafetida, Cannabis Indica, Jalap, Myrrh, or Sumbul. When Tincture of Hydrastis or Tincture of Podophyllum is prescribed with an aqueous solution of mineral salts, it is better to* *add Mucilage of Gum Acacia. The Mucilage should always be diluted with* 3 *or* 4 *times its bulk of Water before adding the Tincture.*

Mucilage of Tragacanth is also useful for the purpose of diffusing the Resin of the Tinctures, especially for Tincture of Jalap, and Tincture of Cannabis Indica when prescribed with salts.

Quinine is sometimes prescribed in mixtures under conditions which cause a precipitation of the alkaloid itself, or one of its sparingly soluble salts; in such cases the addition of 2 *or* 3 *fl. drm. of Mucilage of Gum Acacia to the* 6 *or* 8 *oz. mixtures will prevent the aggregation of the precipitate which would otherwise occur.*

Not Official.

TINOSPORA.

The dried Stem of *Tinospora cordifolia*, Miers., is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies; also **Infusum Tinosporæ** (1 in 10), dose ½ to 1 fl. oz. = 14·2 to 28·4 c.c.; **Liquor Tinosporæ Concentratus** (1 in 2), dose 30 to 60 minims = 1·8 to 3·6 c.c.; and **Tinctura Tinosporæ** (1 in 5), dose 30 to 60 minims = 1·8 to 3·6 c.c.

Not Official.

TODDALIA.

The dried Root-bark of *Toddalia aculeata*, Pers., is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies; also **Infusum Toddaliæ** (1 in 10), dose 1 to 2 fl. oz. = 14·2 to 28·4 c.c.; **Liquor Toddaliæ Concentratus** (1 in 2), dose 30 to 60 minims = 1·8 to 3·6 c.c.

TRAGACANTHA.

TRAGACANTH.

FR., GOMME ADRAGANTE; GER., TRAGANTH; ITAL., GOMMA ADRAGANTE; SPAN., GOMA TRAGACANTO.

Thin, translucent, white, or pale yellowish-white odourless flaky shreds or filaments, possessing a somewhat horny appearance. It is a gummy exudation obtained by incision from *Astragalus gummifer*, Labill., and some other species of Astragalus.

The characteristic of the Syrian Tragacanth is the form of ribbon-like flakes in which it occurs, and its comparative freedom from Starch.

Pure Tragacanth gives a blue coloration with Iodine, varying in depth in different samples, but in any case it is much too faint to be confounded with added Starch.

Medicinal Properties.—Demulcent. Used for the suspension of heavy insoluble powders in liquids; 10 grains of the Compound Powder of Tragacanth are used for each fl. oz. of Water.

1 part of Tragacanth gives more viscosity to Water than 25 parts of Gum Acacia.

Official Preparations.—Glycerinum Tragacanthæ, Mucilago Tragacanthæ and Pulvis Tragacanthæ Compositus; contained in Confectio Sulphuris, Mistura Cretæ, Mistura Guaiaci, Pilula Quininæ Sulphatis, and Pulvis Opii Compositus. The **Mucilage** is contained in Lotio Hydrargyri Nigra.

Not Official.—Bassorin, Gelanthum, and Glucantha.

Foreign Pharmacopœias.—Official in Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Descriptive Notes.—Tragacanth is found in various forms in commerce. The most valuable consists of semi-translucent thin flakes, known in commerce as Syrian Tragacanth, but imported from Persia. This is the official kind. It is 1 to 3 in. (25 to 75 mm.) or more in length and ¼ to 1 in. (6 to 12 mm.) in width, more or less contorted, white, translucent, horny, not easily broken but slightly flexible. The *P.G.* gives the dimensions as at least 0·5 cm. broad and 1 to 3 mm. thick, and its appearance as white and translucent. It is from 1 to 3 mm. thick and is more easily pulverisable by a heat of 50° C. (122° F.), *U.S.P.* Unlike Gum Arabic, it contains Starch grains. The kind known as Smyrna Tragacanth, which is next in quality, is more opaque and occurs in shorter, rather thicker flakes, which, owing to their greater opacity, have a faint, yellowish-white appearance. Small, slender strips are known as Vermicelli Tragacanth. Large, thicker pieces with a reddish tinge are known in trade as Gum Dragon and are used by shoemakers for smoothing rough leather, and for other technical purposes. A variety in small rounded pieces is known as Hog Gum or Caramania Gum, and is used for adulterating small Smyrna Tragacanth. It appears to be derived from *Astragalus Heratensis*, Bunge.

Tests.—Tragacanth is sparingly soluble in Water, but swells up into a gelatinous mass which gives a violet or blue coloration with Iodine Solution, varying in depth in different samples, but in any case the coloration is much too faint to be confounded with that of added Starch. The *B.P.* states that it may be tinted violet or blue by Iodine Solution. The *U.S.P.* and the *P.G.* state that Tragacanth treated with 50 parts of Water swells up and gradually forms a cloudy gelatinous mass, which, when warmed on a water-bath with Solution of Sodium Hydroxide assumes a yellow coloration. In performing the test the *P.G.* employs powdered Tragacanth, the *U.S.P.* Tragacanth. The *U.S.P.* states that this gelatinous mass is tinged blue on the addition of Iodine T.S.; the *P.G.* that when the Tragacanth mucilage is diluted with Water, and the fluid filtered, Iodine Solution added to the residue on the filter produces a blackish-blue coloration, the filtered fluid is not coloured blue by Iodine Solution. The *U.S.P.* states that the addition of Alcohol (94·9 p.c.) to the fluid portion causes a precipitate, but the liquid is not coloured blue by Iodine T.S. Tragacanth leaves when ignited with free access of air from 2 to 3 p.c. of ash, and 4 p.c. is rarely exceeded.

Preparations.

GLYCERINUM TRAGACANTHÆ. GLYCERIN OF TRAGACANTH.
Tragacanth, in powder, ½; Glycerin, 1½; Distilled Water, ½.

Used as a pill excipient, but the following is better for that purpose:—Tragacanth, in powder, 1; Glycerin, 6; rub together and keep for 2 or 3 days before use to allow it to stiffen.

'Diluted Glucose' is better than either.

Official in Dutch, Tragacanth 1, Glycerin 9.

MUCILAGO TRAGACANTHÆ. MUCILAGE OF TRAGACANTH.

Mix 60 grains of Tragacanth, in powder, with 2 fl. drm. of Alcohol (90 p.c.), in a bottle; add Distilled Water *q.s.* to form 10 fl. oz. and shake immediately. (1 in 74)

Foreign Pharmacopœias.—Official in Dutch, 1 in 50; Fr., 1 in 10; Ital. and Port., 1 in 10, also 1 in 100; Mex., 1 in 20; Jap., Tragacanth 1, Glycerin 5, Tepid Distilled Water 94; Russ., Tragacanth 4, Acacia 1, Water 500; U.S., Tragacanth 6, Glycerin 18, Water *q.s.* to make 100.

PULVIS TRAGACANTHÆ COMPOSITUS. COMPOUND POWDER OF TRAGACANTH.

Tragacanth, 1; Gum Acacia, 1; Starch, 1; Refined Sugar, 3. (1 in 6)

Dose.—20 to 60 grains = 1·3 to 4 grammes.

Not Official.

BASSORIN.—Gum Tragacanth 5, Glycerin 2, Water 93.—*St. John's.*

It is also known as **Linimentum Exsiccans.**

It can be medicated with 5 p.c. of Salicylic Acid, Hydronaphthol, or Thioresorcin; with 10 p.c. of Acid Boric, or with 30 p.c. of Ichthyol, Resorcin or Precipitated Sulphur.

Under the name of **Bassorin**, which is properly applied to the insoluble part of Tragacanth, there was introduced from the Continent a few years ago an ointment-basis made by mixing 1 part of powdered Tragacanth with spirit to wet it, then adding 50 parts of Glycerin (by weight) and heating until clear. Martindale quotes the following formula:—Tragacanth 5, Glycerin 2, Rectified Spirit 10, Water to 100. In the spirit contained in a wide-mouthed bottle diffuse the Tragacanth and add the Water, then add quickly the Glycerin diluted with as much Water, and shake well.—*Pharm. Form.*

This has been incorporated in the *B.P.C.*

GELANTHUM (*Unna*).—A firm basis used in dermatology, consisting of Gelatin, Tragacanth, Glycerin and Water.

GLUCANTHA.—Tragacanth, in powder, 240 grains; Water, 240 minims; Syrup of Glucose, 2 oz. Pill Excipient.—*Guy's.*

Not Official.

TRIFOLIUM.

CLOVER.

A **fluid extract** is made from the dried *Trifolium pratense*, L., and from this a **syrup**, a teaspoonful of which 3 or 4 times a day is serviceable in whooping-cough.

The *Trifolium fibrinum* official in the *P.G.* consists of the leaves of *Menyanthes trifoliata*, L.

Not Official.

TRIMETHYLAMINA.

TRIMETHYLAMINE.

C_3H_9N, eq. 58·67.

As supplied in commerce, it is a colourless or pale yellow transparent solution, possessing a strong distinctive odour, and a strongly alkaline reaction. It occurs somewhat frequently in both the animal and vegetable kingdoms. It is a constituent of the herring-brine, and has been detected in urine, unputrified blood of the calf and other animal fluids. It has been detected in Arnica root, the blossoms of the Pear, Whitethorn, Hawthorn and

Wild Cherry. The Trimethylamine of Ergot is probably a decomposition-product of Choline. It is also a product of the dry distillation of certain alkaloids, Wood, etc., and especially of the vinasses or residues left after the distillation of the spirit from fermented beetroot molasses.

Propylamine is sometimes used as a synonym for Trimethylamine, but although isomeric with this substance its use as a synonym is not justified.

It is miscible with Water and with Alcohol (90 p.c.). It forms crystallisable salts. The Hydrochloride is the one chiefly used in medicine. Pure Trimethylamine is a gas at ordinary temperatures.

Tests.—Trimethylamine has a sp. gr. at 0° C. (32° F.) of 0·673. It boils between 9° and 10° C. (48·2° and 50° F.). It is inflammable. It mixes readily with Water, forming a solution which is strongly alkaline in reaction towards Litmus paper. It combines with Carbon Bisulphide with evolution of heat. A glass rod moistened with Trimethylamine evolves white fumes when brought into contact with the vapour of Hydrochloric Acid. It combines with acids to form salts which are mostly crystallisable. Trimethylamine may be distinguished from primary and secondary Methylamines by its negative reaction with Alcoholic Potash and Chloroform, that is to say, it does not evolve the characteristic and highly disagreeable odour of the corresponding Carbamine or Isonitrile when boiled with Alcoholic Potassium Hydroxide Solution and Chloroform; by yielding no reaction when mixed with 1½ times its weight of Ethyl Oxalate (previously dried over Calcium Chloride); and by not affording a volatile Nitrosamine when distilled with Nitrous Acid, and by its solution in excess of Hydrochloric Acid being precipitated by Potassium Ferrocyanide. When neutralised with Acetic Acid the aqueous solution of Trimethylamine yields with Mercuric Chloride Solution a white precipitate. It gives with Iodine and with Iodo-Potassium Iodide (Wagner's) Solution a yellow precipitate; with Tannic Acid Solution a white precipitate, with Potassio-mercuric Iodide (Mayer's) Solution a white precipitate, and with Phospho-molybdic Acid a pale yellow precipitate. It may be determined by titration with Normal Volumetric Sulphuric or Hydrochloric Acid Solution, using Litmus Solution as an indicator of neutrality. 1 c.c. of the Normal Volumetric Acid Solution corresponds to 0·05867 gramme of absolute Trimethylamine.

TRIMETHYLAMINÆ HYDROCHLORIDUM.—Translucent, colourless, very deliquescent crystals, possessing a strong distinctive odour; soluble in Water and in Alcohol (90 p.c.). It should be kept in well-stoppered bottles of a dark amber tint in a cool atmosphere and protected as far as possible from contact with the air, as it is very deliquescent. It has been used in rheumatism and gout.

Dose.—1 to 5 grains = 0·06 to 0·32 gramme.

Tests.—Trimethylamine Hydrochloride dissolves readily in Water, forming a solution which has a neutral reaction towards Litmus paper. When mixed with Sodium Hydroxide Solution it evolves a powerful distinctive odour of Trimethylamine; the base separated from the salt should answer the tests distinctive of Trimethylamine given under that heading. It should dissolve in 10 parts of Absolute Alcohol, indicating the absence of Ammonium Chloride. The odour evolved on mixing it with Sodium Hydroxide Solution should possess the distinctive odour of Trimethylamine, and not an ammoniacal one. It should leave no weighable residue when ignited with free access of air.

Not Official.

TRITICUM.

COUCH GRASS.

The Rhizome of *Agropyrum repens*, Beauv., gathered in the spring and deprived of the rootlets.

Under the title **Agropyrum**, it is official, together with a **Liquid Extract** (1 in 1), in the *Ind.* and *Col. Add.* for Australia, the Eastern and North American Colonies.

Medicinal Properties.—Diuretic, and urinary sedative in cystitis and gonorrhœa.

Official in U.S.; Austr., Belg. and Swiss (Rhizoma Graminis), **Fr.** (Chien-dent), Mex. and Port. (Grama Franceza).

DECOCTUM TRITICI.—Triticum, cut small, 1 oz.; Water, 20 fl. oz.; boil 10 minutes, and strain when cold.

Dose.—4 to 8 fl. oz. = 113·6 to 227·2 c.c. 3 times a day.
Fr., Tisane 1 in 50.

A corresponding preparation, **Decoctum Agropyri**, dose ½ to 2 fl. oz. = 14·2 to 54·8 c.c., is official in the *Ind.* and *Col. Add.* for Australia, the Eastern and North American Colonies.

EXTRACTUM TRITICI LIQUIDUM.—Triticum, in No. 20 powder, 10; percolate with Water until exhausted; evaporate the percolate to 15, and add 5 of Rectified Spirit; set aside for 48 hours, filter, and make up to 20 with a mixture of Water 3 and Rectified Spirit 1.

Dose.—1 to 6 fl. drm. = 3·6 to 21·3 c.c.
More easily prepared, and without heat (which is very detrimental to the Extract), by percolation with the above diluted Alcohol, so as to obtain 20 of finished product from 10 of the drug.

Fluidextractum Tritici.—Percolate 100 of Triticum with boiling Water until exhausted; evaporate the percolate to 75, and having added to it 25 of Alcohol (95 p.c.), mix well and set it aside for 48 hours, then filter the liquid and add sufficient of a mixture of Alcohol (95 p.c.) 1 and Water 3, to make 100. Average dose.—2 fl. drm. = 7·1 c.c.—*U.S.P.*

An **extract** is Official in Austr., Belg., Fr. and Mex.

TROCHISCI.

There are several lozenges in the Pharmacopœia. They are made with four different bases.

The **Simple Basis** consists of 496 of finely powdered Refined Sugar and 19½ of Powdered Gum Acacia, made into a paste of 35½ of Mucilage of Gum Acacia and a small quantity of Distilled Water.

Rose Basis is similar to the above, omitting 17½ of the Mucilage of Gum Acacia, and employing official Rose Water for making the paste.

The **Tolu Basis** is similar to the Simple Basis, substituting 10½ of Tincture of Balsam of Tolu and 10½ of Distilled Water for a portion of the Sugar.

Fruit Basis is similar to the Simple Basis, substituting 56¾ of Black Currant Paste for the same quantity of Sugar.

Compressed Lozenges.—The general method is to granulate the mixture of medicament, Sugar and Gum, by means of Theobroma Emulsion (p. 1191) and highly compress the dried granules (*C.D.* '03, ii. 231). The advantage of avoiding the application of heat is obvious in the case of volatile substances, such as Phenol and essential Oils.—*P.J.* '03, ii. 158.

Not Official.

TYLOPHORÆ FOLIA.

The dried Leaves of *Tylophora asthmatica*, dose ¼ to 2 grains = 0·016 to 0·13 gramme as an expectorant; 15 to 30 grains = 1 to 2 grammes as an emetic; are official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Not Official.

ULEXINE.

Syn.—CYTISINE.

A crystalline alkaloid prepared from *Ulex Europæus*, L., the common gorse or furze.

Solubility.—Freely soluble in Water and Chloroform; insoluble in pure Ether.

The **Nitrate, Hydrochloride,** and **Hydrobromide** are crystalline salts readily soluble in Water.

Medicinal Properties.—Diuretic; useful in cardiac dropsy.

Dose.—$\frac{1}{20}$ to $\frac{1}{15}$ grain = 0·0032 to 0·0042 gramme dissolved in 60 minims of Water.

Ulexine temporarily masks the action of Strychnine.—*T.G.* '87, 280, 690.

Not Official.

ULMUS.

Under this title the dried inner bark of *Ulmus campestris*, L., was official in *B.P.* '64 and '67; the dried bark of *Ulmus fulva*, Mich., deprived of its periderm, is official in the *U.S.P.* The value of both the barks depends upon the mucilage which they contain; that of the *Ulmus fulva* is stated also to preserve fatty substances from becoming rancid.

Decoctum Ulmi (*B.P.* '67), Elm Bark 1, Water 8, boil for 10 minutes, strain and make up to 8, dose 2 to 4 fl. oz. = 56·8 to 113·6 c.c. 3 or 4 times daily.
This has been incorporated in the *B.P.C.*

Mucilago Ulmi (*U.S.*), 6 of Slippery Elm (Ulmus fulva) in 100 of Water, digest in a covered vessel, on a water-bath for one hour, and strain.
This has been incorporated in the *B.P.C.*

UNGUENTA.

For the preparation of the Ointments of the British Pharmacopœia, various bases are used, *e.g.*, Soft Paraffin, Hard Paraffin, a mixture of Hard and Soft Paraffins, Lard, Benzoated Lard, Beeswax and Lanolin.

In the case of the ointments containing alkaloids, Oleic Acid is used with the object of dissolving the alkaloid. In India and the Colonies, when the ointment would be too soft, owing to the warmer climate, indurated Lard, prepared Suet or Beeswax may be employed for the purpose of stiffening the ointment, provided such admixture does not affect the proportion of active ingredient.

Eye Ointments.—The basis for these is neutral yellow Soft Paraffin, which has been melted and strained through fine muslin. The medicament in very fine powder should be first rubbed with a small portion of the Paraffin; and in the case of alkaloids the Paraffin may be warmed (not above 50° C.) until solution is effected.—*St. Thomas's.*
This has been incorporated in the *B.P.C.*
Ointments appear in the Foreign Pharmacopœias, under the following generic titles:—
Austr., Belg., Dan., Dutch, Ger., Hung., Jap., Norw., Russ., Swed., Swiss and U.S., Unguenta; Fr. (Pommades); Ital. (Pomato); Mex., Port. and Span. (Ungüento).

Not Official.

URANIUM NITRATE.

Pale yellow, rhombic crystals, readily soluble in Water. It should be kept in well-stoppered bottles and protected as far as possible from the light. The *B.P. Appendix* describes it as the crystals of pure Uranium Nitrate of commerce.

Used in diabetes. -*B.M.J.* '95, ii. 467; '97, ii. 1044; *Pr.* lxi. 257.

Dose.--1 to 5 grains = 0·06 to 0·32 gramme.

Tests.—Uranium Nitrate when heated melts, loses its Water of crystallisation, and when more strongly heated loses also Nitric Acid. It dissolves readily in Water, forming a clear solution which is acid in reaction towards blue Litmus paper. This aqueous solution affords with Ammonium Hydrosulphide Solution a chocolate-brown precipitate insoluble in excess of the reagent. Ammonium, Potassium or Sodium Hydroxide Solution produces a yellow precipitate insoluble in excess of the reagent. In the presence of Tartaric Acid these reagents do not produce a precipitate, the precipitate produced by Ammonium Hydroxide Solution is soluble in a solution of Ammonium Carbonate. Ammonium, Potassium or Sodium Carbonate Solution yields a light yellow precipitate readily soluble in excess of the reagents. Potassium Ferrocyanide Solution produces a reddish-brown precipitate in sufficiently concentrated solution, or a reddish-brown coloration even in highly diluted solutions; Potassium Ferricyanide Solution produces no change; Sodium Phosphate Solution, more particularly in the presence of Sodium Acetate and Acetic Acid, produces a whitish precipitate. A standard solution of Uranium Nitrate is used for the determination of Phosphoric Acid, Potassium Ferrocyanide Solution being employed as an indicator.

URANIUM SALICYLATE.—A pale yellowish-green crystalline salt; seems (*L.* '05, i. 387) to be better tolerated in cancer than either the **Acetate** or **Nitrate.** Dose, 5 to 20 grains = 0·32 to 1·3 grammes.

The Uranium compounds have lately received a very considerable amount of attention; the metal first gave rise to a suspicion of the existence of a radio-active property in elements, and this suspicion was followed by M. et Madame Curie's discovery of the radio-active element, Radium, in pitchblende.

RADIUM.—A lengthy and intricate process for the separation of this radio-active element has been fully recorded by its discoverers, M. et Madame Curie, in a thesis presented to the Faculté des Sciences de Paris, and reprinted in series in the *Chemical News*, and summarised, *L.* '03, ii. 966. The salt chiefly employed in medicine is the **Radium Bromide**, which is usually supplied in tubes, each containing 0·005 mg. (about $\frac{1}{14}$ grain). It is a white salt, but gradually becomes coloured.

The peculiar action of the rays on tissues has been utilised in the treatment of carcinomatous and sarcomatous growths, in epithelioma, psoriasis and lupus.—*L.* '03, ii. 271, 927, 966, 1388; *B.M.J.E.* '03, ii. 31.

Applied to the skin for 20 to 40 minutes or longer in lupus, rodent ulcer and superficial epitheliomata.—*B.M.J.* '03, ii. 199.

Treatment of consumption by the rays from Radium and Thorium.—*B.M.J.* '03, ii. 197.

It has been discovered in the waters of Bath and Buxton. The deposits from these mineral waters were estimated each to contain about the same amount, the amount in the deposit being relatively much greater than that in solution.—*B.M.J.* '04, i. 797.

17 cases of cancer treated by the application of 30 mg. enclosed in a vulcanite capsule covered with talc. It appears that the emanations from Radium can only act upon the rapidly growing cells, and that the older cells, especially if surrounded by fibrous tissue, are less and less easily affected, and if there be an excess of fibrous tissue, the cells are not at all affected.—*L.* '04, i. 1047.

Relief was obtained in asthma by a 20 minutes' application on the first, followed by a 25 and 30 minutes' application respectively on two successive days. —*B.M.J.* '04, ii. 1234.

In dermatology: 10 mg. of Radium Bromide applied in several sittings daily. —*B.M.J.E.* '05, ii. 15.

In the treatment of rabies (*B.M.J.* '05, ii. 36), animals were inoculated with the virus and exposed for some days to the action of Radium. Controls inoculated with virus of equal strength and not submitted to the same treatment all died.

A record of 9 cases of cancer of the œsophagus treated with Radium. In 6 cases the treatment was so far successful as to cause some widening of the stricture. In the other 3 no improvement took place. ½ to 1 hour's application is made daily or every other day for several weeks.—*B.M.J.* '05, ii. 92.

6 cases of malignant tumour, 5 of which were carcinomata, and 1 of melano-sarcoma, treated by 10 mg. of the **Bromide.** In no case did the treatment prove of any value. Not recommended for cancer of any kind. In operable cases the knife yields infinitely more promise, and in inoperable cases Radium only does harm. All the lupus cases were cured.—*B.M.J.E.* '05, i. 39.

1 mg. of the **Bromide** enclosed in a thin glass tube of 3 cm. length and 2 mm. diameter, in the treatment of granulation of the conjunctiva.—*B.M.J.E.* '05, i. 43. The exposure was carried out daily for 10 to 15 minutes, and resulted in cure.

In the treatment of rodent ulcer. A tube containing 5 mg. of the **Bromide** applied by tying the Radium tube between the ulcer and a layer of gutta-percha tissue, the durations of the applications averaging 20 minutes. Whether the results will be as permanent as after the usual treatment has yet to be proved (*B.M.J.* '05, ii. 9); but no one seeing the new skin can have any doubt of the greater perfection of cosmetic effect over any treatment hitherto known.

5 mg. **Radium Sulphate** of 500,000 units attached with enamel varnish to a plate of Copper 1 in. square, applied for 30 minutes to each lobe of a trilobate tumour affecting the upper eyelid, the exposure being repeated 3 days afterwards. The tumour had melted away, leaving only a small ulcer.—*L.* '05, ii. 548.

A method of coating instruments, celluloid rods, discs, etc., with Radium (*L.* '05, ii. 545), a salt of the latter being dissolved in a suitable volatile solvent tinted with an aniline dye and the instrument dipped in.

Thorium Nitrate, Thorium Lactate, and Thorium Salicylate are salts of the rare metal, Thorium, which have been introduced and which have found more or less use commercially.

Not Official.

UREA.

CARBAMINE, CARBONYLAMIDE.

CH_4N_2O, eq. 59·67.

Colourless, transparent, almost odourless, somewhat hygroscopic, prismatic crystals, possessing a cool, saline taste.

Solubility.—1 in 1 of Water; 1 in 7 Alcohol (90 p.c.).

Introduced as a diuretic; it can dissolve uric acid calculi.—*L.* '01, i. 694, 1672; '01, ii. 1567, 1709; '02, i. 548; '02, ii. 1383, 1486; '03, ii. 1017; *B.M.J.* '02, ii. 1235.

20 grains 3 times a day gradually increased to 120 grains 3 times daily, combined with the application of the X-rays, in lupus vulgaris.—*L.* '02, i. 659.

It is stated to possess the power of dissolving coagulated proteids.—*L.* '02, ii. 527; *P.J.* '03, i. 385.

Dose.—20 to 60 grains = 1·3 to 4 grammes, 3 or 4 times daily.

Hypodermically it may be given in 40-grain doses dissolved in 4 fl. drm. sterilised Water.

Tests.—Urea melts at about 132·5° C. (270·5 F.), and at a temperature of 150° to 160° C. (302° to 320° F.) it is decomposed with the evolution of Ammonia and formation of Biuret. It dissolves readily in Water, forming a solution which is neutral in reaction towards Litmus paper. At the ordinary temperature the solution has no tendency to change, but on boiling it is decomposed with the formation of Ammonium Cyanide. Urea when heated in a test-tube melts, and then evolves Ammonia; when fused with Potassium or Sodium Hydroxide or ignited with Soda-Lime, Ammonia is also evolved, recognised by its distinctive odour and by its reaction on a piece of moistened red Litmus paper which it turns blue. When heated for some time to a temperature not exceeding 160° C. (320° F.), cooled, the residue dissolved in Water, mixed with Sodium Hydroxide Solution and then with diluted Cupric Sulphate Solution, a violet or red coloration is produced; this reaction is known as the Biuret test. When moistened with concentrated solution of Furfural, and a drop of Hydrochloric Acid (sp. gr. 1·1) a fine violet coloration is produced. An aqueous solution when heated with Silver Nitrate affords a white precipitate of Silver Cyanide. Urea is not precipitated by Mercuric Chloride Solution, nor by a solution of Mercuric Acetate. It is not precipitated by Tannic Acid Solution, by Potassio-mercuric Iodide (Mayer's) Solution, by Iodo-potassium Iodide (Wagner's) Solution, Picric Acid Solution, nor the other general reagents for alkaloids. It yields no reaction with either neutral or basic Lead Acetate Solution; it does not reduce Fehling's Solution even on boiling. When mixed with Sodium Hypobromite Solution it evolves Nitrogen, and this reaction is utilised for its determination when necessary, the absence of substances similarly evolving Nitrogen on treatment with Hypobromite being first assured. When ignited with free access of air it should leave no weighable residue.

UROL (Urea Quinate).—Large, colourless, prismatic crystals, having an acid, bitter taste; readily soluble in Water and in Alcohol (90 p.c.).

It has been recommended in the Uric Acid diathesis.

VERONAL. Diethyl-malonyl Urea $C_2H_5C_2H_5C_4N_2H_2O_3$, eq. 182·80.—Colourless, odourless crystals, or a white, crystalline powder, possessing a faintly bitter taste.

Solubility.—1 in 160 of Water; 1 in 8½ of Alcohol (90 p.c.).

A hypnotic. It is given a high place (*B.M.J.E.* '04, ii. 96) as a sleep-producing agent, the effect being chiefly sedative and of little value where there is pain. Although a good hypnotic (*B.M.J.* '04, ii. 1679), it seems to take time to act, and to have a cumulative action, unfavourable results following the administration of 3 doses of 10 grains given at intervals of 1 hour. In a case of mental excitement (*B.M.J.* '04, ii. 1784), where 10 grains thrice daily had been taken for a week toxic symptoms followed. 2 doses of 10 grains each caused urticaria, lasting 3 days, and in the other case local œdema lasting a week.—*B.M.J.* '04, ii. 1736.

A most satisfactory hypnotic; very seldom, except in mental cases, will more than 7 or 8 grains be required for a dose; writers differ very widely as to the dose; best given in hot fluid.—*F.T.* '07, 73.

It acts with comparative certainty in small doses and without deleterious effects. The best of the non-Chlorine hypnotics, and ranks with Chloral.—*B.M.J.* '05, ii. 250.

Best given periodically, and often varied. The smallest effective dose should be used in the commencement, and the drug removed from the system at the earliest opportunity.—*M.P.* '05, ii. 568.

The importance of combining anodynes with hypnotics for administration at night time where there is pain pointed out (*B.M.J.* '05, ii. 1008). A small dose of Aspirin added to Trional or Veronal will produce sleep under many circumstances where the hypnotic alone will fail.

Acts mildly and produces a sleep which is very like that of nature. It fails when there is much pain. Of the unpleasant side effects are mentioned the production of rashes and the diuretic action.—*B.M.J.E.* '05, ii. 4.

Appears to combine certainty of action with the advantages of inducing sleep in such small doses (5 to 10 grains) as have hitherto proved efficacious only in the Chlorine compounds.—*B.M.J.* '05, ii. 1005.

Fatal case of Veronal poisoning.—*L.* '05, ii. 234. ½ oz. taken between a Thursday and a Saturday morning. Attention called to the unrestricted sale of so large a quantity as 1 oz. of the drug to a private person.

Ought to be administered always with great caution in small doses, and especial care ought to be taken in cases of renal insufficiency.—*B.M.J.E.* '05, ii. 63; *B.M.J.* '07, i. 259.

Dose.—5 to 20 grains = 0·32 to 1·3 grammes.

Prescribing Notes.—*It can be made into* pills *containing* 5 *grains each, with* ⅓ *of its weight of* '*Diluted Glucose.*' *It can also be dispensed in cachets.*

Tablets are supplied containing 7½ grains = 0·5 gramme in each.

Official in Swiss, Acidum Diæthylbarbituricum.

Tests.—Veronal melts at 191° C. (375·8° F.). It sublimes without residue, except possibly a faint trace of Carbon. It dissolves sparingly in Water, forming a neutral solution, but is more readily soluble in Alcohol (90 p.c.). The saturated aqueous solution acidified with Nitric Acid yields on the addition of Millon's reagent (1 part by weight of metallic Mercury dissolved in the cold in 1 part by weight of fuming Nitric Acid, the solution diluted with 2 parts of Distilled Water and filtered) a white colourless precipitate. 0·2 of a gramme of Veronal when fused with Potassium Hydroxide evolves Ammonia, recognisable by its distinctive odour and by its action upon moistened red Litmus paper; if the cooled residue be acidified with Diluted Sulphuric Acid, Carbon Dioxide is evolved and a characteristic fatty odour is developed. 1 gramme when ignited with free access of air should leave no weighable residue.

ELIXIR DIETHYLBARBITURIC ACID. — Diethylbarbituric Acid (Veronal), 18 grammes; Compound Tincture of Vanillin (N.F.), 16 c.c.; Alcohol, 175 c.c.; Glycerin, *q.s.* to make 500 c.c. Dissolve the Diethylbarbituric Acid in the Alcohol, add the Compound Tincture of Vanillin, and enough Glycerin to make 500 c.c.—*C.D.* '08, ii. 521.

Bromural (Urea Monobromine Isovalerianate).—In white platelets having a slightly bitter taste; soluble in hot Water, Ether, Alcohol and the alkalis. The dose is 5 to 10 grains = 0·32 to 0·65 gramme, introduced as a hypnotic.—*B.M.J.E.* '07, i. 75.

Not Official.

URETHANE.

ETHYL CARBAMATE. ETHYL-URETHANE. CARBAMIC ACID ETHYL ESTER.

$C_3H_7NO_2$, eq. 88·43.

Colourless, prismatic, odourless crystals or scales, with a peculiar cool taste.

Urethane is official in the *U.S.P.* under the title of Æthylis Carbamas. It may be prepared by the action of Ethyl Alcohol upon Urea or one of its salts.

It should be kept in well-stoppered glass bottles, preferably of a dark amber tint.

Solubility.—1 in 2 of Water; 1 in 1 of Alcohol (90 p.c.); 2 in 3 of Ether.

Medicinal Properties.—Hypnotic, without anodyne properties.

Possesses a slightly irritant action.—*L.* '99, ii. 72.

Was good as a hypnotic, but it had to be used in very large quantities. —*B.M.J.* '05, ii. 250.

Is uncertain and weak in action.—*B.M.J.* '05, ii. 1005.

Dose.—15 to 30 grains = 1 to 2 grammes.

Official in Span., Swiss and Mex. (Uretano).

Tests.—Urethane melts at about 48° C. (118·4° F.). The *U.S.P.* states 47·5° to 50° C. (117·5° to 122° F.), it boils at about 172° C. (341·6° F.). At a higher temperature it is decomposed. When mixed with 5 times its weight of Sulphuric Acid and gently heated it is decomposed with the evolution of Carbon Dioxide. When warmed with Sodium Hydroxide Solution (15 p.c.) the distinctive odour of Ammonia is evolved, and a piece of red Litmus paper suspended in the mouth of the tube is rendered blue. 0·5 of a gramme dissolved in 5 c.c. of Water, containing in solution 1 gramme of dry Sodium Carbonate yields when the solution is warmed with the addition of Iodine a yellow crystalline precipitate of Iodoform when the solution cools. The 10 p.c. aqueous solution should not afford a turbidity on the addition of Silver Nitrate Solution, indicating the absence of Chlorides. 2 c.c. of a 10 p.c. aqueous solution mixed with 2 c.c. of cold concentrated Sulphuric

Acid, the liquids being kept cool during the mixing, should not yield a brownish ring at the junction of the two liquids on the addition of 1 c.c of Ferrous Sulphate Solution, indicating the absence of Nitrates. Separate solutions of 1 gramme of Urethane dissolved in 1 c.c. of Water should neither afford a crystalline precipitate on the addition of 1 c.c. of Nitric Acid, nor on the addition of Mercuric Nitrate Solution, nor on the addition of Oxalic Acid Solution, indicating the absence of Urea or Carbamide. 1 gramme when heated with free access of air should leave no weighable residue, indicating the absence of mineral impurities.

HEDONAL (Methyl-propyl-carbinol-urethane).—Colourless crystals, or as a white crystalline powder, slightly soluble in cold Water, but more readily in hot Water.

Introduced as a hypnotic. Stated (*B.M.J.E.* '05, i. 34) to have been given as a hypnotic to supplement Chloroform anæsthesia in doses of 30 grains from 1½ to 1 hour before operation, small quantities of Chloroform then sufficing to produce anæsthesia.

Dose.—15 to 30 grains = 1 to 2 grammes, in cachet.

Somnal.—Stated to contain Urethane and Chloral Hydrate; was introduced as a hypnotic, in doses of 30 grains.

Phenyl-Urethane (Euphorin).—A white crystalline powder, only sparingly soluble in Water, soluble in Alcohol (90 p.c.) and in Ether. It should be preserved from the light. A powerful analgesic, but like some other powerful analgesics it tends to interfere with the respiratory processes and to weaken the heart. It has proved of special service in the pain of orchitis. Dose.—1 to 5 grains = 0·06 to 0·32 gramme.—*B.M.J.* '98, ii. 1055.

UVÆ URSI FOLIA.

BEARBERRY LEAVES.

FR., BUSSEROLE; GER., BÄRENTRAUBENBLÄTTER; ITAL., UVA URSINA; SPAN., GAYUBA.

The dried Leaves of *Arctostaphylos Uva-ursi*, Sprengel.

Contains a crystallisable glucoside, **Arbutin**, soluble in Water and Alcohol (90 p.c.), dose, 1 to 15 grains.

Medicinal Properties.—Astringent and diuretic; it is a disinfectant to the urinary mucous membrane, and is valuable in inflammation of the bladder and urethra.

Official Preparation.—Infusum Uvæ Ursi.

Not Official.—Infusum Uvæ Ursi Concentratum.

Official in Austr., Belg., Dan., Dutch, Fr. (Busserole), Ger., Ital., Jap., Mex. (Gayaba del pais), Norw., Port. (Uva Ursina), Russ., Swed., Swiss and U.S.

Descriptive Notes.—The leaves are about ¾ to 1 in. long (19 to 25 mm.) long and ¼ to ⅜ in. (6 to 9 mm.) broad, obovate, rounded at the apex, and tapering below into a short leaf stalk, dark green and shining on the upper surface, with a network of depressed small veins, the under surface paler and reticulated with dark veins; the margin is entire and slightly reflexed. The taste is astringent, and the odour faint and tea-like. The leaves of *Vaccinium Vitis-Idæa*, L., bear some resemblance to Bearberry Leaves, and are stated to have been mixed with them, but can be easily distinguished by having dark dots on the under surface, by being crenately toothed near the apex and more revolute at the margin.

The powdered leaves are characterised by the straight-walled epidermal cells, the large stomata of the lower epidermis, short palisade cells, and the presence of tracheids and numerous serial prismatic crystals.

Tests.—Bearberry Leaves leave from 2 to 3 p.c. of ash.

Preparation.

INFUSUM UVÆ URSI. Infusion of Bearberry.

Bearberry Leaves, bruised, 1; boiling Distilled Water, 20; infuse for 15 minutes and strain. (1 in 20)

Dose.—$\frac{1}{2}$ to 1 fl. oz. = 14·2 to 28·4 c.c.

In the 1864 Pharmacopœia the Leaves were not ordered to be bruised; *when bruised*, the infusion is stronger, but a large deposit forms in the strained fluid.

Incompatibles.—Iron salts, Lead salts, Silver Nitrate, vegetable alkaloids, Gelatin.

Foreign Pharmacopœias.—Official in Fr. (Tisane), 1 in 100; Ital., 1 in 20 Decoction; U.S. has a **fluid extract.**

Not Official.

INFUSUM UVÆ URSI CONCENTRATUM.—Bearberry Leaves, in No. 20 powder, 40; Alcohol, (90 p.c.), 25; Dilute Chloroform Water (1 in 1000), *q.s.* to make 100. Prepare by the repercolation.—*Farr* and *Wright*, *P.J.* '06, i. 165 and '07, i. 621; *C.D.* '06, i. 252; and *Y.B.P.* 1907, 248.

Dose.—$\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c.
This appears in the *B.P.C.*

VALERIANÆ RHIZOMA.

VALERIAN RHIZOME.

B.P.Syn.—Valerian Root.

Fr., Valériane Officinale; Ger., Baldrian; Ital., Valeriana; Span., Valeriana.

The dried erect Rhizome and Roots of *Valeriana officinalis*, L., collected in the autumn.

That from wild plants growing on dry soil is preferred. It owes its properties to a volatile Oil and a volatile Acid; the salts of the latter (Valerianates) are not prepared from the root, but synthetically from Amylic Alcohol.

The bulk of the Valerian root used in this country is of foreign growth, and should either be allowed or expressly prohibited in *B.P.*

Under the title **Valerianæ Indicæ Rhizoma**, the dried Rhizome and Rootlets of *Valeriana Wallichii*, DC., are official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Medicinal Properties.—It is a nervine stimulant and antispasmodic. Useful in hysteria, in functional nervous diseases associated with hysteria, and as an adjunct to tonics.

The difference in physiological action between the juice and the dried root of Valerian is stated (*L.* '05, i. 1396) to be due to oxidation of the active constituents during drying. The sedative and antispasmodic action of the fresh juice is very constant, and is not accompanied by any permanent stimulating action. Since the fresh juice owes its peculiar physiological properties to the undecomposed bornyl iso-valerianate contained in the volatile Oil, it would appear to be more desirable to use the volatile Oil in preference to the other preparations of Valerian.

Official Preparation.—Tinctura Valerianæ Ammoniata.

Not Official.—Tinctura Valerianæ, Tinctura Valerianæ Ætherea, Oleum Valerianæ, Valyl, Acidum Valerianicum, Fluidextractum Valerianæ, Infusum Valerianæ, Infusum Valerianæ Concentratum.

Foreign Pharmacopœias.—Official in all. An **Extract**, and a 1 in 20 **Infusion** are official in Ital. An **Extract** in Belg., Dutch, Fr., and Russ.; a **Fluid Extract** in Dan., Mex. and U.S.

Descriptive Notes.—Valerian Root varies much in quality and in price. A little is grown in this country at Chesterfield, where the form *sambucifolia*, Willd., appears to be the species cultivated; at Long Melford the more robust form *Mikanii*, Syme, is preferred, the latter yielding a rather larger and more odorous root. Valerian Root is also imported from Thuringia in Germany, Hungary, Belgium, and France, and rarely from Japan, under the name of Kesso; the Japanese plant is referred to the var. *latifolia*, Miq. The French root is generally rather paler, the Japanese is a dark brown with a scurfy surface, and is powerfully odorous; it is probably a distinct species.

Valerian Root consists of a short rootstock, $\frac{1}{3}$ to $\frac{1}{2}$ in. (8 to 12 mm.) in diameter and less than 1 in. (25 mm.) long, giving off numerous slender, brownish, brittle roots, 3 to 4 in. (7·5 to 10 cm.) long and about $\frac{1}{10}$ in. (2·5 mm.) in diameter, tapering into slender rootlets at the extremity, and whitish in transverse fracture. The rhizome is hard and horny internally, but becomes hollow with transverse septa when old and occasionally exhibits a few lateral, short, horizontal branches. When fresh it is almost without smell, the valerianic odour being developed during the drying or by injury to the surface. Under the microscope the characteristic features are the hypoderm cells with undulated walls, the abundance of small rounded or muller-shaped starch grains, the oil drops in the cortical cells, and the porous sclerenchymatous cells of the rhizome.

Tests.—Valerian Root yields from 8 to 10 p.c. of ash. The *B.P.* states that the odour developed in the process of drying is strong, characteristic, and disagreeable; the taste unpleasant, camphoraceous, and slightly bitter; the *U.S.P.* that the odour is peculiar, becoming stronger and more unpleasant on keeping the drug; the taste is camphoraceous and somewhat bitter.

Preparation.

TINCTURA VALERIANÆ AMMONIATA. AMMONIATED TINCTURE OF VALERIAN.

Valerian Rhizome, in No. 40 powder, 4 oz.; Oil of Nutmeg, 30 minims; Oil of Lemon, 20 minims; Solution of Ammonia, 2 fl. oz.; Alcohol (60 p.c.), 18 fl. oz.; by maceration.

Tests.—Tinct. Valerian. Ammon. has a sp. gr. of 0·935 to 0·945; it contains about 3·5 p.c. w/v of total solids and about 53 p.c. w/v of Absolute Alcohol. When freshly prepared a measured quantity of 10 c.c. of the tincture requires about 4·3 c.c. of Normal Volumetric Sulphuric Acid Solution to neutralise the Ammonia, Methyl Orange, or Cochineal Solution being employed as an indicator of neutrality. This corresponds to 0·72 p.c. w/v of absolute Ammonia.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

Tinctura Valerianæ Ammoniata (*U.S.*).—Valerian, in No. 60 powder, 20; Aromatic Spirit of Ammonia, *q.s.* to make 100; by macero-percolation.

Tinctura Valerianæ Indicæ Ammoniata.—Indian Valerian, in No. 40 powder, 4 oz.; Oil of Nutmeg, 30 minims; Oil of Lemon, 20 minims; Solution of Ammonia, 2 fl. oz.; Alcohol (60 p.c.), 18 fl. oz.; by maceration. Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c. It is official in the *Ind.* and *Col. Add.* for India and the Eastern Colonies.

Not Official.

FLUIDEXTRACTUM VALERIANÆ.—100 of Valerian, in No. 40 powder, is first moistened with 30 of a mixture of Alcohol (95 p.c.) 75 and Water 25, macerated in a percolator for 48 hours, then exhaust, reserve the first 85 of percolate and evaporate the remainder at a temperature not exceeding 50° C. (122° F.) to a soft extract, dissolve this in the reserve portion, and make up with the menstruum to 100.—*U.S.P.* Dose, 30 to 60 minims = 1·8 to 3·6 c.c.

This has been incorporated in the *B.P.C.*

This Fluid Extract evaporated to a firm extract constitutes Extractum Valerianæ.—*B.P.C.*

INFUSUM VALERIANÆ.—Valerian Rhizome, bruised, ¼; boiling Distilled Water, 10. Infuse in a covered vessel for 1 hour and strain.—*B.P.* 1885.

This is incorporated in the *B.P.C.*, infusing 15 minutes.

INFUSUM VALERIANÆ CONCENTRATUM.—Valerian Rhizome, in No. 20 powder, 40; Strong Solution of Ammonia, 0·3; Alcohol (90 p.c.), 25; Dilute Chloroform Water (1 in 1000), *q.s.* to make 100. Mix the powder with the Strong Solution of Ammonia and sufficient Chloroform Water to damp it evenly, set aside for 2 hours, and then submit to repercolation.—*Farr* and *Wright*, *P.J.* '06, i. 165 and '07, i. 622; *C.D.* '06, i. 252; and *Y.B.P.* '07, 251.

Dose.—½ to 1 fl. drm. = 1·8 to 3·6 c.c.

This appears in the *B.P.C.*, using 20 of Valerian Rhizome instead of 40.

TINCTURA VALERIANÆ.—Percolate 1 of Valerian Rhizome, in No. 40 powder, with sufficient Alcohol (60 p.c.), to yield 8.—*B.P.* 1885.

Dose.—1 to 2 fl. drm. = 3·6 to 7·1 c.c.

This was included in the *B.P.C. Formulary* 1901.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Mex., Norw., Port., Russ., Swed., Swiss and U.S., 1 in 5; Jap., 1 in 10; Mex. and U.S. have also **Fluid Extract.** All by weight, except U.S.

Tests.—Tincture of Valerian (*B.P.* '85) has a sp. gr. of 0·924 to 0·930; contains about 2·0 p.c. w/v of total solids and about 60·0 p.c. w/v of Absolute Alcohol.

TINCTURA VALERIANÆ ÆTHEREA (*Ger.*).—Valerian, 1; Spirit of Ether, by weight, 5.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Ger., Hung., Jap., Norw., Span. and Swiss, 1 in 5; Mex., 1 and 5, Sp. Æther (sp. gr. 0·76); Russ., Valerian 1, Alcohol (90 p.c.) 4, Ether (0·725), 2. All by weight.

Tests.—Ethereal Tincture of Valerian (*P.G.*) has a sp. gr. of about 0·815, and contains about 1·0 p.c. w/v of total solids.

OLEUM VALERIANÆ.—A yellow volatile Oil; sp. gr. 0·930 to 0·960. Dose.—2 to 5 minims = 0·12 to 0·3 c.c.

Foreign Pharmacopœias.—Official in Austr., Belg., Hung. and Port.

VALYL (Diethylamide Valerianate).—An oily liquid, possessing a nauseous odour and taste. A sedative in nervous affections. Dose.—2 to 10 grains = 0·13 to 0·65 gramme.

Best given in capsules.—*B.M.J.E.* '02, i. 3.

ACIDUM VALERIANICUM. Valerianic Acid, Valeric Acid. $C_5H_{10}O_2$, eq. 101·31.—A transparent, colourless, or nearly colourless, oily liquid, possessing a strong distinctive disagreeable odour. It is used in the preparation of the Valerianates.

It should be kept in well-stoppered glass bottles of a dark amber tint and in a cool place.

Official in Fr.

Tests.—Absolute Valeric Acid has a sp. gr. of 0·938 at 15° C. (59° F.). It boils about 175° C. (347° F.). Commercial Valeric Acid contains a varying proportion of the pure acid, it is recognised by its distinctive penetrating disagreeable odour. When warmed with a mixture of Sulphuric Acid and a little Ethyl or Amyl Alcohol it evolves a fragrant fruity odour. When neutralised with Ammonia and tested with Ferric Chloride T.S. a brownish-red precipitate is thrown down, when this precipitate is allowed to settle the supernatant liquid should be colourless; in the presence of Formic or Acetic Acid the supernatant liquid is coloured red. When concentrated Valeric Acid is agitated with Copper Acetate Solution, anhydrous Cupric Isovalerate separates in oily drops, which ultimately crystallise in greenish-blue monoclinic prisms, the reaction distinguishes Valeric Acid from Butyric Acid, the latter acid forming with a moderately concentrated Cupric Acetate Solution an immediate crystalline precipitate of Cupric Butyrate. The acid may be readily determined by direct titration with Normal Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. 1 c.c. of Normal Volumetric Sodium Hydroxide Solution corresponds to 0·10131 gramme of absolute Valeric Acid.

The acid should be completely volatile, and should leave no weighable residue.

Not Official.

VANILLA.

The Fruit of *Vanilla planifolia*, Andr., chiefly used as a flavouring agent. The finest quality comes from Mexico, and large quantities also come from Bourbon. It owes its fragrance to **Vanillin,** which on oxidation yields **Vanillic Acid.** Some text-books refer to them as the same substance, but this is not the case, Vanillic Acid is without odour and does not form a crystallisable compound with Sodium Bisulphite.

Foreign Pharmacopœias.—Official in Austr., Belg., Fr., Ger., Jap., Mex., Swiss and U.S. Swiss has Tincture 1 in 5; Fr. and U.S. 1 in 10.

Descriptive Notes.—Vanilla pods are the nearly ripe fruits of *Vanilla planifolia*, Andr., prepared by scalding, gradual fermentation and drying. After the curing process (*Agric. News*, vi., p. 291; *P.J.* (4) xiii., p. 640) the pods are sorted out into various lengths so as to form bundles of uniform size. Mexican Vanilla is considered to be the most aromatic; the pods are 8 to 10 inches (20 to 25 cm.) long, flattened, and about ⅜ inch (9 mm.) in diameter at the broadest part. The upper end tapers gradually to the point of attachment to the plant, and is curved and slightly twisted there. The longest pods obtain the highest price. When kept the pods become 'frosted' or covered with 'givre,' which consists of fine crystals of Vanillin. The value of Vanilla does not, however, depend upon the amount of Vanillin contained in the pods, but upon the aroma, which the artificial Vanillin cannot entirely replace.

VANILLIN ($C_8H_8O_3$, eq. 150·92).—It is the Aldehyde of Methylprotocatechuic Acid, and yields on oxidation Vanillic Acid ($C_8H_8O_4$). It is official in the *U.S.P.*, and is stated to occur naturally in Vanilla, or to be made artificially from several Ortho-dihydroxybenzene derivatives. Fine white needle-shaped crystals, possessing the peculiar distinctive odour and taste of Vanilla. It has an acid reaction.

Foreign Pharmacopœias.—Official in Fr. and U.S., not in the others.

Tests.—Vanillin melts at about 80° C. (176° F.); the *U.S.P.* states between 80° and 81° C. (176° and 177·8° F.), and that at 285° C. (545° F.) it can be distilled without decomposition in a current of Carbon Dioxide. It is sparingly soluble in Water, but dissolves readily in Alcohol, Ether and Chloroform, also in aqueous solutions of alkali Hydroxide, from which latter solution it is reprecipitated on neutralisation of the alkali Hydroxide. The aqueous solution affords with Ferric Chloride T.S. a blue colour, changing to brown when the liquid is boiled, and affording a white precipitate on the addition of Lead Acetate Solution. This precipitate is soluble in hot Water and crystallises out in scales as the solution cools. When Vanillin is warmed with concentrated Alcoholic Sodium Hydroxide Solution, a few drops of Chloroform added, and the liquid again warmed, no odour of Phenol Isocyanide should be evolved, indicating the absence of Acetanilide.

TINCTURA VANILLÆ.—Mix 65 of Alcohol (95 p.c.) with 35 of Water. Macerate 10 of Vanilla, cut small and bruised, in 50 of the mixture for 12 hours. Drain off the liquid and set it aside. Transfer the Vanilla to a mortar, beat it with 20 of Sugar into a uniform powder, then pack it in a percolator, and continue the percolation with more of the menstruum to make 100.—*U.S.P.*

This has been incorporated in the *B.P.C.*

Not Official.

VERATRI VIRIDIS RHIZOMA.

GREEN HELLEBORE RHIZOME.

The Rhizome and Rootlets of *Veratrum viride*, Aiton.

Collected in autumn in U.S. and Canada.

The principal alkaloidal constituent (about half) is **Cevadine,** the same base as is found in Cevadilla; **Jervine** and **Pseudo-jervine,** in about equal proportions, constituting the remainder.—*P.J.* (3) ix. 986.

Medicinal Properties.—Sedative. Has been given to quiet spinal spasms; should be prescribed cautiously.

10 minims of the tincture with 5 grains of Chloral Hydrate given hourly, or 10 minims hypodermically, in puerperal eclampsia.—*L.* '98, i. 146; '99, i. 1430.

Foreign Pharmacopœias.—Official in Belg., Ger., Swed. and Swiss (Rhizoma Veratri (Veratrum Album)), Mex. (Eleboro Blanco and Eleboro Verde), U.S. (Veratrum (Album or Viride)).

TINCTURA VERATRI VIRIDIS (*B.P.* '85).—Green Hellebore Rhizome, in No. 40 powder, 1; Rectified Spirit (Alcohol 88·76 p.c.), *q.s.* to yield 5.

(1 in 5)

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

The best menstruum is stated to be Alcohol (70 p.c.).—*C.D.* '92, ii. 651.

Official in Ger., 1 in 10; U.S., 1 in 10; *B.P.C.*, 1 in 10. U.S. has also a **Fluid Extract,** 1 in 1.

Tests.—Tincture of Green Hellebore (*B.P.* '85) has a sp. gr. of about 0·952; it contains about 2·0 p.c. w/v of total solids and about 32·0 p.c. w/v of Absolute Alcohol.

VERATRINA.

VERATRINE.

A white, or greyish-white, odourless, amorphous powder; possessing a very bitter acrid taste and leaving a feeling of numbness on the tongue. It is intensely irritating to the nasal mucous membrane and the smallest particle produces violent sneezing. Permanent in the air. It is officially described as an alkaloid, or mixture of alkaloids, prepared from Cevadilla, the dried ripe Seeds of *Schœnocaulon* *officinale*, A. Gray; the *U.S.P.* describes Veratrine as a mixture of alkaloids obtained from the Seed of *Asagræa officinalis*, Lindley.

It should be kept in well-stoppered glass bottles of a dark amber tint and protected as far as possible from contact with the light.

Commercial Veratrine is liable to be very variable in physiological activity.

The nomenclature of the alkaloids contained in this mixture has undergone modification. Wright and Luff assign to the crystallisable portion (called by Merck 'Veratrine') the name of **Cevadine**, as it yields on saponification Cevadic Acid, the name **Veratrine** being reserved for the base described by Couerbe, which yields Veratric Acid. Another base has been called **Cevadilline**, but the bulk of the alkaloid refuses to yield any crystallisable or otherwise definable salts.

Solubility.—Scarcely soluble in cold Water; 1 in 1000 of boiling Water; 1 in 3 of Alcohol (90 p.c.); 1 in 6 of Ether; 1 in 3 of Chloroform; sparingly in Glycerin; about 1 in 80 of Olive Oil; and readily in diluted Acids.

Medicinal Properties.—A powerful irritant poison, scarcely ever given internally. Externally it acts as an analgesic in neuralgia, more particularly of the fifth nerve. It should not be used where the skin is broken.

Ph. Ger. maximum single dose, 0·005 gramme; maximum daily dose, 0·015 gramme.

Official Preparation.—Unguentum Veratrinæ.

Not Official.—Oleatum Veratrinæ.

Antidotes.—Emetic, stimulants, Coffee, warmth to the extremities. Recumbent position to be strictly maintained.—*Murrell.*

Foreign Pharmacopœias.—Official in all the Foreign Pharmacopœias, except Dan. Dutch, Cevadinum.

Tests.—Veratrine, *B.P.*, melts when heated to a yellow liquid; Veratrine, *U.S.P.*, softens at 145° C. (293° F.) and melts at 152° C. (305·6° F.); no m.p. is assigned to Veratrine, *P.G.* It dissolves in Nitric Acid, forming a yellow solution. When warmed with Hydrochloric Acid it dissolves, yielding a blood-red colour permanent for some days. Triturated with Sulphuric Acid it yields first a yellow and then a bright red mixture, subsequently exhibiting a yellowish-green fluorescence when viewed by reflected light, the fluorescence becoming more intense on further addition of acid. If the Sulphuric Acid mixture be warmed a violet-red coloration is produced, or if it be allowed to stand a violet-red coloration is gradually produced. A drop of Syrup added to the mixture of Sulphuric Acid and Veratrine darkens the red colour and gives it a purple coloration; by exposure to air the purple becomes blue. Sulphuric Acid with one-seventh of its volume of Water is a more useful reagent. Veratrine, *U.S.P.*, yields with Sulphuric Acid containing a trace of Selenious Acid a brownish-green colour. Veratrine dissolves readily in Alcohol (90 p.c.), the alcoholic solution being alkaline in reaction towards Litmus paper. The alcoholic solution should not yield a precipitate on the addition of Platinum Chloride Solution, indicating the absence of other alkaloids such as Brucine, Morphine and Strychnine. 0·5 of a gramme when heated with free access of air should leave no weighable residue. A distinguishing reaction for Veratrine is its irritating effect upon the nasal mucous membrane, a tiny particle of the dust from the powdered alkaloid causing violent sneezing. The test should, however, be applied with extreme caution, and the same caution should be exercised in tasting substances or liquids presumed to contain the alkaloid.

UNGUENTUM VERATRINÆ. VERATRINE OINTMENT.

Dissolve 10 grains of Veratrine in 40 grains of Oleic Acid, at a gentle heat, and add 450 grains of Lard. (1 in 50)

Now 1 in 50 instead of 1 in 63, Hard and Soft Paraffins and Olive Oil replaced by Oleic Acid and Lard.

Foreign Pharmacopœias.—Official in U.S., 1 in 25; Port. and Russ., 1 in 50.

Not Official.

OLEATUM VERATRINÆ (*U.S.*).—Veratrine 2, Oleic Acid 50, Olive Oil, *q.s.* to make 100; by weight.

This has been incorporated in the *B.P.C.* under the title **Oleinatum Veratrinæ.** *Syn.* Oleatum Veratrinæ.

Squibb suggests that this should be made 10 p.c. as more likely to give relief in neuralgia.—*Squibb*, p. 164.

Not Official.

VIBURNUM.

BLACK HAW.

The Bark of *Viburnum prunifolium*, L.

It is official in the *Ind.* and *Col. Add.* for India and the Eastern and North American Colonies; also **Extractum Viburni Prunifolii Liquidum** (1 in 1). Dose, 60 to 120 minims = 3·6 to 7·1 c.c.

Medicinal Properties.—Strongly recommended as a preventive in cases of threatened abortion; to control menorrhagia and metrorrhagia and in all kinds of pelvic inflammation; brilliant results in dysmenorrhœa.—*M.A.* '95, 192; *B.M.J.* '95, ii. 1562; *L.* '95, ii. 1625.

Foreign Pharmacopœias.—Official in Austr., Dutch, Fr., Mex., Span. and U.S.

The bark of *Viburnum opulus* has also been used in similar cases.

ELIXIR VIBURNI PRUNIFOLII.—Fluid Extract of Viburnum Prunifolium, 12·5; Compound Tincture of Cardamom, 7·5; Aromatic Elixir, 80. Average dose, 1 fl. drm. = 3·6 c.c.—*U.S.N.F.*

This has been incorporated in the *B.P.C.*

ELIXIR VIBURNI PRUNIFOLII COMPOSITUM.—Liquid Extract of Viburnum Prunifolium, 50; Dry Extract of Hydrastis, 1·75; Oil of Coriander 0·50; Oil of Caraway, 0·50; Glycerin, *q.s.* to produce 100.—*B.P.C.*

EXTRACTUM VIBURNI PRUNIFOLII LIQUIDUM.—Percolate 20 of Black Haw, in No. 60 powder, with Alcohol (70 p.c.) until exhausted; reserve the first 17; reduce the remainder to a soft extract; dissolve this in the reserved portion, and add Alcohol (70 p.c.) *q.s.* to make 20.—*Ind.* and *Col. Add.*

Dose.—60 to 120 minims = 3·6 to 7·1 c.c.

This has been incorporated in the *B.P.C.*

This Fluid Extract evaporated to a firm extract constitutes **Extractum Viburni Prunifolii.**—*B.P.C.*

FLUIDEXTRACTUM VIBURNI PRUNIFOLII (*U.S.*). Exhaust by percolation Viburnum, in No. 40 powder, 100 parts, with a mixture of Alcohol (95 p.c.), 2, and Water, 1; reserve the first 85, and evaporate the remainder to a soft extract; dissolve this in the reserved portion, and add enough menstruum to measure 100.

Foreign Pharmacopœias.—Official in Austr., Dutch and Fr., 1 in 1. U.S. has also Fluidextractum Viburni Opuli, 1 in 1.

VINA.

WINES.

Medicated wines are of very ancient date, and were admitted to our earliest Pharmacopœias. Two only remain as representatives of the old Pharmacopœias—Vinum Antimoniale and Vinum Ferri; the former was prepared by digesting 4 oz. of the Regulus of Antimony in powder with 3 lb. of 'White' Wine (Pharmacopœia Londinensis, 1655). The latter (Vinum Chalybeatum) was made with Rhenish Wine and Iron filings.

VINUM XERICUM.

SHERRY.

A Spanish Wine.

Unless good sound Sherry is used, the preparations are apt to spoil by keeping.

It contains about 20 p.c. Alcohol by volume.

Official Preparations.—Used in the preparation of Vinum Antimoniale, Vinum Colchici, Vinum Ferri, and Vinum Ipecacuanhæ.

Not Official.—Vinum Xericum Detannatum.

Tests.—Sherry of good quality has a sp. gr. of about 0·985 to 0·998. It is officially required to contain not less than 16 p.c. by volume of Ethyl Hydroxide. Good sound Sherries contain from 16 to 20 p.c. by volume of Absolute Alcohol, the Alcohol may be determined by a similar method to that given under Spiritus Frumenti. The total acid usually amounts to about 0·52 p.c. w/v calculated as Tartaric Acid, that is to say, a measured quantity of 10 c.c of the Wine will require about 7·0 c.c. of Deci-normal Volumetric Sodium Hydroxide Solution for neutralisation, Phenolphthalein Solution being used as an indicator of neutrality. The extractive matter may vary from 2 to 5 p.c. w/v. The ash amounts to about 0·55 p.c. w/v. The Wine is officially required to be free from Salicylic Acid. The official method of testing being as follows:—A measured quantity of 50 c.c. is mixed with 50 c.c. of Water, 5 c.c. of Normal Volumetric Sulphuric Acid Solution added, and the mixture distilled. The first 10 c.c. portion of the distillate is rejected, the balance is shaken with Ether, the ethereal liquid separated and the Ether removed by evaporation. The residue is required to yield no violet coloration on the addition of Ferric Chloride T.S. Theoretically considered the test appears unsatisfactory. The first 10 c.c. portion may possibly contain Ethyl Salicylate passing over with the spirit, the evaporation of the ethereal Solution of the Salicylic Acid is not to be recommended owing to the risk of loss by evaporation. A preferable plan would have been to have added sufficient Water to the ethereal liquid to form a separate layer, and 1 or 2 drops of Ferric Chloride T.S. and to shake vigorously, if Salicylic Acid be present the lower aqueous layer is coloured an immediate violet. A useful test for the presence of Salicylic Acid is given under Vinum Aurantii.

Not Official.

VINUM XERICUM DETANNATUM (*B.P.C.*).—Sherry, 100; Gelatin, in No. 100 powder, 0·15; macerate for 24 hours (at a temperature not exceeding 15·5° C.) with frequent agitation, and decant.

Bird has shown (*Y.B.P.* '99, 363) that by substituting Gelatin in No. 100 powder (now commercially procurable) for Gelatin cut small, as previously directed in the *B.P.C. Formulary* 1894, it is possible to completely detannate an average sample of Sherry in 24 hours. The same Wine treated with sheet Gelatin cut small required days for the completion of the process.

Not Official.

VINCA MAJOR.

GREATER PERIWINKLE.

An **infusion** made of dried Herb 2, boiling Water 20, is powerfully astringent, and will often arrest menorrhagia.

Dose.—A wineglassful.

Foreign Pharmacopœias.—Official in Fr. (Pervenche Officinale).

Dose of the **fluid extract,** 1 to 2 fl. drm. = 3·6 to 7·1 c.c.

Not Official.

VIOLA.

The flowers of *Viola odorata*, L., are official in the French, Portuguese and Spanish Pharmacopœias.

The herb *Viola tricolor*, L., is official in the Austrian, German and Swiss Pharmacopœias. That official in the Austrian is the cultivated variety; that in the German and Swiss from wild plants.

A certain amount of interest is attached to the leaves of the Violet on account of an apparent improvement following the employment of the fresh infusion of the leaves in a case (*L.* '05, i. 713) in which it was alleged that a patient might have been suffering from malignant disease. A handful of the leaves was soaked in a pint of boiling Water for 24 hours and the liquid poured off, divided into 2 parts, 1 part being taken internally during the 24 hours and the other used as a fomentation. An apparent recovery from a presumably malignant growth of the mouth resulted. An examination of the leaves of the common Violet (*Viola odorata*) in the *Lancet* laboratory (*L.* '05, i. 1085) showed the presence of two crystalline bodies, one glucosidal and the other alkaloidal in character, and also a dark green Oil. Alcohol was found a much more effective solvent than an aqueous menstruum; in view of the employment of an aqueous infusion the latter point is of interest. The alkaloid isolated behaved chemically much in the same way as Emetine, the principal alkaloid of Ipecacuanha. It has been stated (*Y.B.P.* '05, 467; *C.D.* '05, ii. 977; *P.J.* '05, ii. 869) that any activity which Violet leaves possess is due either to the glucoside, the product of its decomposition, or a natural ferment associated with it. Reckoned as Violaquercitrin, the glucoside from Princess of Wales Violet leaves amounted to 5 p.c. of the weight of the fresh leaves. A fresh infusion was found to extract nine-tenths of the glucoside present in the leaves. No volatile constituent was isolated, no alkaloid could be detected, no Salicylic Acid was found. The presence of a glucoside was proved, but the glucoside was not isolated. Objection has been taken to the evidence of the uses of Violet leaves having been unfortunately collected chiefly by unskilled persons, and that it has therefore been lacking in definiteness, and consequently in value. After the definite expression of the opinions mentioned in the above reference, it is disappointing to find in a paper read before the Therapeutical Society, October 30th, 1906, and reported in the *Lancet*, '06, ii. 1318, that 'all attempts to isolate and identify a glucoside from Violet leaves have failed; similarly, there was no evidence of a ferment being present; the only positive fact resulting from the experiments being that the leaves and their preparations yield under certain conditions glucose.'

It has been pointed out that the reputation of Violets for the treatment of malignant growths was founded on the use of wild Violets, at least as far back as James I., and that it is therefore desirable that in any inquiry into the subject wild Violets should be used, such as have been used for centuries, and not a recent cultivated Violet as employed at the present time. In the light of the above remarks, the varieties official in the Continental Pharmacopœias will be of interest. It will be noted that wild Violets are official in the German and Swiss Pharmacopœias, and cultivated Violets in the Austrian.

Not Official.

YEAST.

BEER YEAST.

The ferment obtained in brewing Beer and produced by *Saccharomyces cerevisiæ*.

A viscid, frothy semi-fluid, possessing a sour vinous odour and a somewhat bitter taste. It is insoluble in Alcohol, practically insoluble in Water. Exposed to a moderate heat it loses its liquid portion and becomes dry, hard and brittle, and in this form may be preserved for some time, though apparently with a loss of much of its peculiar power. **Yeast cakes** are prepared by putting Yeast into sacks, washing with Water, submitting it to pressure, and ultimately drying it; **Compressed Yeast,** the undried product, is now largely used.

Medicinal Properties.—Antiseptic and stimulating; it has been recommended internally as a proteolytic against boils and carbuncles, and has been found useful in obstinate dysentery. In typhoid fever (*L.* '05, i. 463) 60 grammes daily, in 3 doses, commenced about the seventh day, to improve the gastro-intestinal symptoms, to reduce the temperature and diminish diarrhœa. Living Yeast does not possess any directly bactericidal or phagocytic properties. Injected intravenously it causes intravascular clotting of the blood. Subcutaneous injections of pure cultures of living Yeast can be made in animals without producing any ill effects. Killed Yeast produces the same effects as living Yeast. The immediate effect of subcutaneous injections is to produce leucopenia, rapidly followed by the leucocytosis. The effects produced by the injections of Yeast are probably due to the nucleo-albumen contained in the cells of the body generally, and cause a large increase in the antiseptic and anti-bactericidal substances normally present in the blood serum.—*B.M.J. Supplement* '05, ii. 7.

In furunculosis and acne.—*F.T.* '07, 19.

Dose.—½ to 1 oz. alone or with Water.

Furonculine and **Levurine** are powdered forms of dehydrated Yeast.

Not Official.

YOHIMBINE.

Silky white needles, or as a white inodorous amorphous powder, which has a tendency to change in colour on exposure to light; it should therefore be kept in well-closed glass bottles of a dark amber tint and protected as far as possible from the light. It possesses a faint odour of Benzaldehyde. It is slightly soluble in Water, readily soluble in Methyl, Ethyl, or in Amyl Alcohol, in Ether and in Chloroform. It is an alkaloid derived from the bark of *Corynanthe yohimbi* (Schumann) or Yohimbehe tree, which grows in the Southern Cameroons district in Africa.

It is said to act as an aphrodisiac. It causes anæsthesia of the cornea and conjunctiva when dropped into the conjunctival sac. It is stated (*L.* '05, i. 1013) to be useful in chronic affections of the eye which require stimulation. It is preferred to Tropacocaine, as its effects are more persistent, and to Cocaine, as it does not affect the epithelium, interfere with the nutrition of the cornea or produce mydriasis and hypotony, and is, moreover, non-toxic. 25 c.c. of a 1 p.c. solution may be injected subcutaneously without harm, producing a local anæsthesia which lasts for nearly 2 hours. It has been found (*B.M.J.E.* '05, i. 28) useful in cases of toxic impotence. It is reported to have a favourable influence in cases of neurasthenic impotence.

Tests.—Yohimbine melts at about 234° C. (453·2° F.). According to Arnold and Behrens (*Pharmazeutische Zentralhalle*, xlii. 49) it has certain properties in common with Cocaine. It produces a temporary anæsthesia somewhat resembling that occasioned by Cocaine. They give the following reactions for distinguishing between the two:—The m.p., Cocaine melts at 98° C. (208·4° F.), Yohimbine as stated above; Cocaine Hydrochloride melts at 183° C. (361·4° F.); Yohimbine Hydrochloride has a m.p. as given below; Cocaine when heated for 5 minutes with Sulphuric Acid yields an odour of Methyl Benzoate, Yohimbine yields a faint odour resembling Peppermint; Cocaine when treated first with Fuming Nitric Acid and then with Hydrochloric Acid Solution gives no colour reaction, Yohimbine is coloured at first a deep green and then yellow by Nitric Acid, on the addition of Alcoholic Potassium Hydroxide Solution a cherry-red colour is produced; Cocaine remains colourless when dissolved in strong Sulphuric Acid, and when treated with Chlorinated Lime, Yohimbine gives an intense orange-red colour; Cocaine gives a black coloration when triturated with Mercuric Chloride, Yohimbine produces no such black coloration. When dissolved in strong concentrated Sulphuric Acid it affords on the addition of a minute crystal of Potassium Bichromate a beautiful violet coloration. It yields with Cane Sugar and Sulphuric Acid a wine-red colour. Attention, however, has been called to the fact that Saccharose, Glucose or Furfurol by themselves afford, with Sulphuric Acid, a red or reddish-violet coloration, and that Sesame Oil also produces a similar reaction. This colour reaction, therefore, cannot be regarded as serviceable for the identification of Yohimbine. 0·1 of a gramme when ignited with free access of air should leave no weighable residue.

YOHIMBINE HYDROCHLORIDE.—It occurs in colourless crystals, slightly soluble in Water. It is the Hydrochloride of the alkaloid Yohimbine.

It should be kept in well-closed bottles of a dark amber tint and protected as far as possible from contact with the light.

Tests.—Yohimbine Hydrochloride melts at 290° C. (554° F.); Cocaine Hydrochloride melts at 183° C. (361·4° F.). An aqueous solution affords an amorphous greyish-violet precipitate on the addition of Auric Chloride Solution (1 p.c.), an aqueous solution of Cocaine Hydrochloride yielding on the addition of the same reagent a pale yellow precipitate of microscopic needles.

Not Official.

YERBA SANTA.

The dried Leaves of *Eriodictyon Californicum* (Hook. and Arn.), Greene, are official in the *U.S.P.* They contain about 30 p.c. of resin, some essential oil, Glucose, two hydrocarbons, fatty acids, Phytosterol and three crystalline substances of a phenolic nature.—*J.C.S. Abs.* '06, ii. 885.

A stimulating expectorant, recommended in acute bronchitis.

Fluidextractum Eriodictyi (*U.S.*), 1 in 1, with a mixture of Alcohol (95 p.c.) 4 and Water 1; average dose, 17 minims = 1 c.c.

Not Official.

ZINCUM.

ZINC.

Zn, eq. 64·91.

A bluish-white metal, of peculiar taste and of a perceptible smell when rubbed; laminated, and with a crystalline fracture.

It occurs native, as a Sulphide or as a Carbonate, and is separated from impurities by sublimation.

The laminated or granulated metal is official in the Appendix to the *B.P.* Metallic Zinc is official in the body of the *U.S.P.* It appears in the lists of Reagents in the Appendix to the *P.G.* The *U.S.P.* states that it is in the form of thin sheets, in irregular granulated pieces, or moulded into thin pencils or in fine powder.

Official Preparations.—Used to prepare Liquor Zinci Chloridi, Zinci Chloridum, Zinci Oxidum, Zinci Sulphas.

Foreign Pharmacopœias.—Official in Mex., Span. and U.S.

Tests.—Zinc has a sp. gr. of 7·1, the *U.S.P.* states from 6·9 when it is cast to 7·2 after it is rolled. It fuses at 411·6° C. (773° F.). The *U.S.P.* states 412° to 415° C. (773·6° to 779° F.). At about 940° C. (1724° F.) it boils, and may be readily distilled. It dissolves readily in diluted Hydrochloric Acid, simultaneously evolving Hydrogen gas, which burns with a blue flame on ignition. It yields, when dissolved in Hydrochloric Acid, a clear solution, which should answer the following tests:—When neutralised with Ammonia Solution it yields with Ammonium Hydrosulphide Solution a white precipitate insoluble in Acetic Acid, soluble in Hydrochloric Acid. When mixed with sufficient Ammonium Chloride to hold in solution the Hydroxide which would otherwise be precipitated, it yields on the addition of Ammonia Solution a white precipitate; it affords with Hydrogen Sulphide a similar white precipitate, insoluble in Acetic Acid, soluble in Hydrochloric Acid; with Ammonia Solution, Potassium or Sodium Hydroxide Solution it affords a white precipitate soluble in excess of the reagent; with Potassium Ferrocyanide Solution it yields a white precipitate insoluble in diluted Hydrochloric Acid. It should not contain Antimony, Arsenic, Aluminium, Cadmium, Copper, Iron, Lead or Magnesium, Sulphur or Phosphorus. A measured quantity of 10 c.c. of a solution containing 5 p.c. of the metal in diluted Hydrochloric Acid (a slight excess of Hydrochloric Acid being present) should not afford a coloration or turbidity when mixed with an equal volume of freshly prepared saturated Hydrogen Sulphide Solution and allowed to stand for 30 minutes, indicating the absence of Antimony, Arsenic, Cadmium, Copper and Lead. The solution in dilute Hydrochloric Acid when mixed with Ammonium Chloride and Ammonia Solution and boiled should not yield either a flocculent white precipitate or a brown flocculent precipitate, indicating the absence of Aluminium and Iron. A further portion of a similar solution when mixed with Ammonium Chloride and Ammonia Solution should not afford a turbidity on the addition of either Ammonium Oxalate Solution or Sodium Phosphate Solution, indicating the absence of Calcium and Magnesium. The specimen should not yield a reaction for Arsenic when examined by the modified Gutzeit's test or by the Bettendorf's test. The Hydrogen gas evolved during the solution of the metal in diluted Hydrochloric Acid should not possess the distinctive disagreeable odour of Hydrogen Sulphide, nor should a strip of Lead Acetate paper be altered in colour when suspended in the issuing gas, indicating the absence of Sulphur. A strip of paper moistened with Silver Nitrate Solution when similarly held in the escaping gas should not be blackened, indicating the absence of Phosphorus, and affording confirmatory evidence of the absence of Antimony, Arsenic and Sulphur. In performing the time-limit test for Arsenic, Cadmium, Copper, Lead and Iron, the *U.S.P.* dissolves 1 gramme of Zinc in a mixture of 10 c.c. of Nitro-hydrochloric Acid and 10 c.c. of Water, evaporates the solution to dryness, moistens the residue with 2 c.c. of Hydrochloric Acid, again evaporates to dryness, and finally dissolves the residue in 10 c.c. of Water.

ZINCI ACETAS.

ZINC ACETATE.

Zn $(C_2H_3O_2)_2$, $3H_2O$, eq. 235·71.

FR., ACÉTATE DE ZINC; GER., ZINKCHLORID; ITAL., ACETATO DI ZINCO; SPAN., ACETATO ZINCICO.

Soft white glistening monoclinic crystals, possessing an acetous odour and a sharp metallic taste.

Zinc Acetate official in the *U.S.P.* contains 2 molecules of Water of crystallisation, that official in the *B.P.* 3 molecules. The *U.S.P.* Acetate is required to contain in the uneffloresced condition not less than 99·5 p.c. of pure crystallised Zinc Acetate.

It should be kept in well-closed vessels, as it has a tendency to effloresce on exposure to air, and also to lose Acetic Acid with the formation of a basic salt.

Solubility.—10 in 25 of Water; 4 in 1 of boiling Water; 1 in 40 of Alcohol (90 p.c.); 1 in 3 of boiling Alcohol (90 p.c.).

Medicinal Properties.—Similar to the Sulphate, chiefly used as a local astringent.

Dose.—1 to 2 grains = 0·06 to 0·13 gramme.

Not Official.—Lotio Zinci Acetatis.

Foreign Pharmacopœias.—Official in Ger., Hung., Mex., Port., Russ. and U.S.

Tests.—Zinc Acetate when heated partially fuses, losing its Water of crystallisation and a certain amount of acid. At still higher temperatures it is decomposed, and when ignited at a dull red heat leaves a residue of Zinc Oxide. It dissolves readily in Water, forming a solution which is slightly acid in reaction towards blue Litmus paper, but which is not always clear, as the commercial salt sometimes contains a small proportion of basic salt. It affords, however, a clear solution on the addition of a little Acetic Acid. The solution answers the tests distinctive of Zinc given under that heading. The aqueous solution affords on the addition of Ferric Chloride Solution a red coloration, changing to a reddish-brown precipitate on boiling. When warmed with Sulphuric Acid it evolves a distinctive acetous odour. When warmed with Sulphuric Acid containing a little Alcohol (90 p.c.) it evolves the peculiar odour of Ethyl Acetate (Acetic Ether). The dry salt, heated with a minute proportion of Arsenious Anhydride, yields the distinctive but highly poisonous odour of Cacodyl Oxide. The impurities mentioned under Zinc should be absent. Solutions should answer the tests given under the headings of Barium Chloride, Silver Nitrate, Sulphuric Acid, and Gutzeit's test appearing in small type below, indicating the absence of Sulphates, Chlorides, impurities derived from the use of Acetic Acid containing empyreumatic impurities and Arsenic.

Hydrogen Sulphide.—In an aqueous solution (1–10) of the salt Hydrogen Sulphide T.S. produces a pure white precipitate. The liquid filtered off from the precipitate should not leave a weighable residue on evaporation, *P.G.* 10 c.c. of an aqueous solution (1–20), to which 1 c.c. of Hydrochloric Acid has been added, should not respond to the time-limit test for Arsenic, Cadmium, Lead and Copper; in applying this test the addition of Ammonia Water should be omitted, *U.S.P.*

Sulphuric Acid.—On gently warming the salt with Sulphuric Acid it should not undergo any blackening, *P.G.*

Barium Chloride.—An aqueous solution of the salt (1–20) after the addition of a few drops of diluted Nitric Acid should remain clear upon the addition of T.S. of Barium Chloride, *U.S.P.*

Silver Nitrate.—An acidulated solution as above should remain clear on the addition of T.S. of Silver Nitrate, *U.S.P.*

Gutzeit's Test.—5 c.c. of the aqueous solution of the salt (1–10) should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Not Official.

LOTIO ZINCI ACETATIS.—Zinc Acetate, 2 grains; Water, 1 fl. oz. Mix. An astringent **collyrium** in conjunctivitis, or as an **injection** in gonorrhœa after the acute stage has passed.

Tincture of Opium causes no precipitate with this Lotion.

A lotion very commonly prescribed at one time was that containing Zinc Sulphate and Lead Acetate, which mutually react with formation of soluble Zinc Acetate and insoluble Lead Sulphate; it has been superseded by the above.

Not Official.

ZINCI BROMIDUM.

A whitish, very deliquescent, granular powder.

It should be kept in well-stoppered glass bottles and exposed as seldom as possible to the air, as it is extremely deliquescent.

The *U.S.P.* salt is required to contain when anhydrous at least 97 p.c. of pure Zinc Bromide.

Solubility.—4 in 1 of Water; 2 in 1 of Alcohol (90 p.c.).

Dose.—2 grains = 0·13 gramme 3 times a day for epilepsy.

Official in Mex., Span. and U.S.

Tests.—Zinc Bromide when strongly heated fuses; the *U.S.P.* states at a temperature of 394° C. (741·2° F.). It dissolves readily in Water, yielding a solution which has a slightly acid reaction towards blue Litmus paper, and which affords the tests distinctive of Zinc given under that heading. The solution also yields with Silver Nitrate Solution a yellowish curdy precipitate insoluble in Nitric Acid; when separated and washed, practically insoluble in Ammonia Solution, but readily soluble in Potassium Cyanide Solution. When heated with Sulphuric Acid and Manganese Dioxide, reddish vapours of Bromine are evolved, which produce an orange-yellow stain on filter paper moistened with Starch Mucilage. It is required by the *U.S.P.* to contain not less than 97 p.c. of pure Zinc Bromide as volumetrically determined by dissolving a weighed quantity of 0·3 of a gramme of the anhydrous salt in 10 c.c. of Water, and titrating with Tenth-normal Volumetric Silver Nitrate Solution, using Potassium Chromate Solution as an indicator, not less than 26 c.c. nor more than 26·8 c.c. should be required to produce the end reaction. The impurities mentioned under Zinc should be absent from Zinc Bromide. The *U.S.P.* fixes a limit of Chloride, requiring that 1 gramme dissolved in 50 c.c. of Acetic Acid and 2 grammes of Lead Dioxide (free from Chloride) added; the mixture evaporated in a small beaker to at least 10 c.c.; the residue diluted with 10 c.c. of Distilled Water and filtered, should not give more than a slight turbidity on the addition of 2 c.c. of Nitric Acid and a few drops of Silver Nitrate Solution. The aqueous solution of the salt when mixed with Chlorine Water, diluted with an equal volume of

Water, and shaken with Carbon Bisulphide, the latter solution should not assume a violet colour, indicating the absence of Iodide. The aqueous solution of the salt should not yield a turbidity on the addition of Barium Chloride Solution, indicating the absence of Sulphate.

ZINCI CARBONAS.

ZINC CARBONATE. ZINC HYDROXYCARBONATE.

$ZnCO_3(ZnH_2O_2)_2, H_2O$, eq. 339·68.

FR., CARBONATE DE ZINC; GER., ZINKCARBONAT; ITAL., CARBONATODI ZINCO
SPAN., CARBONATO ZINCICO.

A dry, white, odourless and tasteless amorphous impalpable powder, permanent in the air.

It may be produced by precipitating solution of Zinc Sulphate with Sodium Carbonate. The precipitated Carbonate official in the *U.S.P.* is the hydrated Zinc Carbonate, and is required to yield, on ignition, not less than 72 p.c. of Zinc Oxide. The Carbonate is not official in the *P.G.*

The anhydrous normal Carbonate, $ZnCO_3$, occurs native as **Calamine.** The composition of the precipitated hydrated Carbonate varies much according to the conditions under which it is formed.

Medicinal Properties.—A mild astringent, used with other substances as a dusting powder, also in lotions.

Official Preparations.—Used in the preparation of Zinci Acetas, Zinci Oxidum, and Zinci Valerianas.

Foreign Pharmacopœias.—Official in U.S., Zinci Carbonas Præcipitatus.

Tests.—Zinc Carbonate when strongly heated loses Water and Carbon Dioxide, leaving a residue which whilst hot is yellow, and which when cold is white. It dissolves readily and completely with effervescence in Diluted Nitric Acid, and yielding a gas which, when passed into Lime Water, affords a white precipitate soluble in a sufficient excess of the gas, or soluble with effervescence in Diluted Hydrochloric Acid. The solution in Diluted Hydrochloric Acid answers the tests distinctive of Zinc given under that heading. The *B.P.* does not require it to yield any definite percentage of Oxide upon ignition. The *U.S.P.* requires it to yield not less than 72 p.c., 1 gramme of the salt when strongly ignited being required to yield a residue weighing not less than 0·72 gramme. The impurities mentioned under Zinc should also be absent. A solution in Diluted Nitric Acid should not afford a pronounced turbidity with either Silver Nitrate Solution or Barium Chloride Solution, indicating the absence of more than traces of Chloride and Sulphate. The *U.S.P.* fixes a limit of alkali calculating out to 0·3 p.c. of anhydrous Sodium Oxide, the test is described in small type below under the heading of Phenolphthalein. The solution employed by the *U.S.P.* in carrying out the tests of identity and purity is obtained by mixing 1·25 grammes of the salt with 10 c.c. of Diluted Sulphuric Acid and 10 c.c. of Water, removing the undissolved excess by filtration after effervescence has ceased.

Time-limit Test.—Add 10 c.c. of diluted Sulphuric Acid and 10 c.c. of Water to 1·25 grammes of the salt, and after effervescence has ceased, remove the undissolved excess by filtration. A portion of the filtrate acidulated with Hydrochloric Acid should not respond to the time-limit test for Arsenic, Cadmium, Lead and Copper; in applying this test the addition of Ammonia Water should be omitted, *U.S.P.*

Phenolphthalein.—If 1 gramme of the salt be placed in a flask with 10 c.c. of boiling Water, and 2 drops of Phenolphthalein T.S. added, not more than 1 c.c. of Tenth-normal Hydrochloric Acid Volumetric Solution should be required to discharge the red colour, *U.S.P.*

ZINCI CHLORIDUM.

ZINC CHLORIDE.

$ZnCl_2$, eq. 135·29.

Fr., Chlorure de Zinc; Ger., Zinkchlorid; Ital., Cloruro di Zinco; Span., Cloruro Zincico.

White or almost white, very deliquescent fused irregular masses, or pencil-shaped sticks, or a white granular deliquescent powder. It is strongly caustic, and should be handled with great care.

Its official method of preparation is by the interaction of Zinc and Hydrochloric Acid.

It should be kept in small, well-stoppered glass bottles and exposed as little as possible to the air, as it is extremely deliquescent.

Solubility.—10 in 4 of Water; 1 in 1 of Alcohol (90 p.c.); freely in Ether; 1 in 4 (nearly) of Glycerin.

Medicinal Properties.—Diluted it is astringent, antiseptic and disinfectant. Seldom given internally. Externally, applied as a caustic, in form of **point** or **paste,** to indolent ulcers and malignant growths, to condylomata, and to nævi. As a **lotion,** 20 grains to 1 fl. oz. of Water, it is an efficient substitute for Carbolic Acid, in syringing offensive pus cavities, sinuses, foul ulcers, etc.

As a paste for packing the cavity of uterus in malignant disease.—*B.M.J.* '95, i. 756.

As an injection (1 grain to 1 fl. oz.) in gonorrhœa.

Official Preparation.—Liquor Zinci Chloridi.

Not Official.—Zinc Chloride Points, Compound Zinc Chloride Points, Caustique au Chlorure de Zinc, Guttæ Zinci Chloridi, Guttæ Zinci Chloridi cum Cocaina, Lotio Zinci Chloridi, Pasta Zinci Chloridi, Pasta Zinci Chloridi Comp., Pulvis Zinci Chloridi Comp.

Antidotes.—*See* Zinci Sulphas, p. 1250.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—Zinc Chloride fuses when heated. The *U.S.P.* says at a temperature of 115° C. (239° F.). The *B.P.* states that it is almost entirely soluble in Water, Alcohol (90 p.c.) and Ether. The commercial salt frequently contains a small proportion of Oxychloride, and does not then yield clear solutions with these solvents. The *U.S.P.* states that the 1 in 20 aqueous solution should be clear, or at the most only faintly opalescent, and if mixed with an equal volume of Alcohol (94·9 p.c.), a single drop of Hydrochloric Acid should suffice to render 10 c.c. of the mixture perfectly clear. The *P.G.* states that the 1 in 20 aqueous solution should be clear, or at the most but faintly turbid, and that the flocculent precipitate resulting on the addition of 3 volumes of Alcohol (90 p.c.) to this solution should again disappear on the addition of 1 drop of Hydrochloric Acid. The aqueous solution answers the tests distinctive of Zinc given under that heading. On the addition of Silver Nitrate T.S. it affords a white curdy precipitate, which, when separated and washed, is insoluble in Nitric Acid, readily soluble in Ammonia Solution or Potassium Cyanide Solution. When the salt is heated with Manganese Dioxide and Sulphuric Acid it evolves a greenish-yellow gas, possessing a distinctive pungent odour, and which produces a blue coloration with paper soaked in Starch Mucilage and Potassium Iodide Solution. Neither the *B.P.* nor the *P.G.* states that it should contain any definite percentage of Zinc Chloride. The *U.S.P.* requires that it shall contain not less than 99·5 p.c. of pure Zinc Chloride as gravimetrically determined by dissolving 0·5 of a gramme of the salt in 200 c.c. of boiling Water, adding 5 drops of Phenolphthalein T.S. and sufficient Sodium Carbonate T.S. with constant stirring to yield a permanent alkaline reaction; the resulting precipitate is transferred to a filter and washed with boiling Water until all soluble matter is dissolved; dissolved in a sufficient quantity of Nitric Acid, evaporated to dryness and ignited until constant in weight, the residue should weigh not less than 0·297 gramme. The impurities mentioned under Zinc should be absent from the Zinc Chloride. It should respond to the test given in small type below under the heading of Barium Chloride, indicating the absence of Sulphates, and should also answer the tests described below under the heading of Ammonia Solution and Hydrogen Sulphide, indicating the absence of Calcium, Magnesium and alkali impurities.

Hydrogen Sulphide.—An aqueous solution (1–10) should not become coloured by T.S. of Hydrogen Sulphide after the addition of Hydrochloric Acid, *P.G.* An aqueous solution (1–20) with 1 c.c. of diluted Hydrochloric Acid added should not respond to the time-limit test for Arsenic, Cadmium, Lead and Copper; in applying this test the addition of Ammonia Water should be omitted, *U.S.P.*

Barium Chloride.—An aqueous solution (1–20) after the addition of 1 c.c. of diluted Hydrochloric Acid should not be rendered turbid by the addition of T.S. of Barium Chloride, *U.S.P.*

A (1-10) aqueous solution of the salt should not be rendered turbid on the addition of T.S. of Barium Nitrate, *P.G.*

Ammonia Solution and Hydrogen Sulphide.—1 gramme of the salt should give a clear solution with 10 c.c. of Water and 10 c.c. of Ammonia T.S., and this solution should give a pure white precipitate with excess of Hydrogen Sulphide T.S. The liquid filtered off from this precipitate after evaporation and heating to redness should not leave a weighable residue, *P.G.*

LIQUOR ZINCI CHLORIDI. SOLUTION OF ZINC CHLORIDE.

16 of granulated Zinc dissolved by heating with 44 of Hydrochloric Acid mixed with 20 of Distilled Water, and evaporated to 40. It should be free from Iron and Lead.

When made as above the solution will be basic and precipitate Oxychloride on dilution with Water. It should be evaporated rather lower, then neutralised with Hydrochloric Acid (so that it will cease to precipitate on being diluted with 10 volumes of Water, or when this diluted solution just reddens Methyl Orange Solution), and finally made up to 40.

When finished without loss the above quantities will yield a solution sp. gr. about 1·53. For details and an improved formula of **Chlor-Zinc Iodine (Schulze's Solution)** *see P.J.* (3) xxiii. 648.

Official in U.S., sp. gr. 1·548 at 25° C. (77° F.).

Fr. Codex states that the commercial solutions vary from 1·26 to 1·81; that having a sp. gr. of 1·45 is to be preferred.

Tests.—Solution of Zinc Chloride has a sp. gr. of about 1·53. The *B.P.* states 1·530. The *U.S.P.* solution contains about 50 p.c. by weight of Zinc Chloride, and is required to possess a sp. gr. of about 1·548 at 25° C. (77° F.). It should answer the tests distinctive of Zinc given under that heading and of Chlorides given under Zinc Chloride. It should not contain the impurities mentioned under Zinc, and when diluted should yield no turbidity on the addition of Barium Chloride T.S., indicating the absence of Sulphate.

Not Official.

ZINC CHLORIDE POINTS.—Zinc Chloride fused and run into conical moulds; preserved in glass tubes.

Darts of Zinc Chloride have been used in the treatment of anthrax.—*B.M.J.* '87, ii. 644.

COMPOUND ZINC CHLORIDE POINTS.—Zinc Chloride, 1; Zinc Oxide, 1; Wheaten Flour, 2; Water to make a stiff paste, which is formed into points.

CAUSTIQUE AU CHLORURE DE ZINC.—Zinc Chloride, 32; Zinc Oxide, 8; Dried Wheaten Flour, 24; Distilled Water, 4.—*Fr.*

GUTTÆ ZINCI CHLORIDI.—Zinc Chloride, 2 grains; Distilled Water, 1 fl. oz.—*London Ophthalmic.*

GUTTÆ ZINCI CHLORIDI CUM COCAINA.—Zinc Chloride, 2 grains; Cocaine Hydrochloride, 10 grains; Distilled Water, 1 fl. oz.—*London Ophthalmic.*

LOTIO ZINCI CHLORIDI.—Zinc Chloride, 1 grain; Distilled Water, 1 fl. oz.—*London Ophthalmic.*

This has been incorporated in the *B.P.C.* as follows:—Zinc Chloride, 1; Distilled Water, 400.

PASTA ZINCI CHLORIDI.—Zinc Chloride, 1, 2 or 4; Starch, 6; Lard, 1; Glycerin of Starch, *q.s.*; rub the Zinc Chloride with the Lard and Starch, and make into a thick paste with Glycerin of Starch.—*University.*

PASTA ZINCI CHLORIDI COMPOSITA.—Zinc Chloride paste, 94; Extract of Opium, 4; rub the Extract smooth with 2 of Water, and then mix thoroughly with the paste.—*University.*

PULVIS ZINCI CHLORIDI COMP.—Zinc Oxide, mixed with an equal weight of Zinc Chloride, will preserve the latter dry enough to blow through a tube into any cavity required, and may be so kept in a bottle for a long time.

Not Official.

ZINC IODIDUM.

A white or whitish powder, which rapidly becomes moist and changes to a brown colour on exposure to the air. On account of its hygroscopic nature and its liability to thus change, it should be kept in well-stoppered bottles of a dark amber tint and protected as far as possible from the light. It is readily soluble in Water, Alcohol (90 p.c.), or Ether.

It has been used as an alterative remedy in chorea, scrofula and hysteria, but has not come into general use. It has also been employed as an external application.

Tests.—Zinc Iodide dissolves readily in Water, forming a solution which is acid in reaction towards blue Litmus paper, this solution should answer the tests distinctive of Zinc given under that heading. An aqueous solution yields with Silver Nitrate Solution a curdy, yellow precipitate insoluble in Nitric Acid, practically insoluble in Ammonia Solution, but soluble in Potassium Cyanide Solution; with Mercuric Chloride Solution it yields a brilliant scarlet precipitate soluble in Potassium Iodide Solution. The salt is official in the *U.S.P.*, which requires it to contain, when anhydrous, not less than 98 p.c. of pure Zinc Iodide as volumetrically determined by dissolving a weighed quantity of 0·5 of a gramme of the dry Iodide in 20 c.c. of Water, adding 35 c.c. of Tenth-normal Volumetric Silver Nitrate Solution, 5 c.c. of Nitric Acid and 3 c.c. of Ferric Ammonium Sulphate T.S., shaking the mixture well and titrating the excess of Tenth-normal Volumetric Silver Nitrate Solution with Tenth-normal Volumetric Potassium Sulphocyanate Solution; not less than 3·4 nor more than 4 c.c. should be required.

Dose.—½ to 2 grains = 0·032 to 0·13 gramme.

Foreign Pharmacopœias.—Official in Mex. and U.S.; not in the others.

Not Official.

ZINCI NITRAS.

Large, colourless, deliquescent, prismatic crystals, very soluble in Water and in Alcohol (90 p.c.).

Medicinal Properties.—Used as a caustic in the place of Zinc Chloride; it penetrates deeper and produces less pain.

It can be made into a **paste** in the same way as Zinc Chloride.

Tests.—Zinc Nitrate answers the tests distinctive of Zinc given under that heading, and should also be free from the impurities usually occurring in the metal and referred to in the text. When Ferrous Sulphate Solution is carefully poured upon the surface of a cooled mixture of concentrated Sulphuric Acid and a solution of the salt, at the point of contact of the two liquids a dark brown zone appears.

When ignited it leaves a residue of Zinc Oxide.

ZINCI OXIDUM.

ZINC OXIDE.

ZnO, eq. 80·79.

Fr., Oxyde de Zinc; Ger., Zinkoxyd; Ital., Ossido di Zinco;
Span., Oxido Zincico.

An odourless and tasteless, white amorphous impalpable powder, which gradually absorbs Carbonic Anhydride from the air. The method of preparation has some effect upon the colour of the product. A sample prepared from the precipitated Carbonate by ignition has a tendency to a faint yellow colour, whilst a sample prepared by the combustion of metallic Zinc is pure white.

It should be kept in well-closed vessels as it gradually absorbs Carbonic Anhydride from the air. The official process of preparation is by the ignition of Zinc Carbonate at a dull red heat, or by combustion with metallic heat.

Medicinal Properties.—Internally, but with doubtful success, as a sedative in chronic nervous spasmodic affections, and to check the perspirations of phthisis. Externally, as a mild astringent application in eczema and slight excoriations and ulcerations, in the form of **ointment** or **paste**: absorbent as a **dusting powder** when mixed with Starch.

Dose.—3 to 10 grains = 0·2 to 0·65 gramme.

Prescribing Notes.—*Generally prescribed in the form of* **pills.** *A good pill may be made by adding 'Diluted Glucose,' q.s. It is also given in lotions, with and without an equal quantity of Prepared Calamine, q.v. p.* 280.

Official Preparation.—Unguentum Zinci. Used in the preparation of Zinci Sulphocarbolas.

Not Official.—Dusting Powder, Emplastrum Zinci Oxidi, Gelatinum Zinci Durum, Gelatinum Zinci, Glycéré d'Oxyde de Zinc, Lassar's Paste, Pasta Unna, Pasta Zinci et Ichthamolis, Pessus Zinci, Pilula Zinci et Belladonnæ, Pulvis Zinci Oxidi Compositus, Pulvis Zinci Oxidi et Acidi Salicylici, Pulvis Zinci Oxidi et Acidi Borici, Pulvis Zinci Oxidi et Amyli, Pulvis Zinci Oleatis Compositus, Unguentum Zinci Stearatis, Unguentum Zinci cum Acido Salicylico, Pulvis Zinci et Calomelanos, Zinci Oleas (Shoemaker's), Zinc Oxide Plaster Mulls, Zinc and Salicylic Plaster Mull, and Zinc Gelatin.

Foreign Pharmacopœias.—Official in all; Dan., Ger. and Swiss have also Crude.

Tests.—Zinc Oxide when heated assumes a yellow colour which disappears on cooling. It dissolves readily and completely and with effervescence in diluted acids. When dissolved in Diluted Hydrochloric Acid the solution should answer the tests distinctive of Zinc given under that heading. The *B.P.* states that it should be entirely soluble when rubbed, and if necessary warmed, with Ammonia Solution mixed with strong Ammonia Solution. The 17th Edition of the *Companion* contains the following note:—'It is questionable whether any commercial Zinc Oxide is entirely soluble in Ammonia.' The *B.P.C.* states that the Oxide is never completely soluble in Ammonia Solution. Samples obtained in 1908 from the leading manufacturers were found, with one exception, to be readily and completely soluble in Ammonia. The *U.S.P.* states that it should be completely soluble in Ammonia Water. The *P.G.* makes no reference to its solubility in Ammonia. Neither the *B.P.* nor the *P.G.* states a requisite percentage of Zinc Oxide, nor is a method of determination indicated. The *U.S.P.* requires that it shall contain not less than 99 p.c. of pure Zinc Oxide as determined by digesting a weighed quantity of 1 gramme of the freshly ignited Zinc Oxide with 30 c.c. of Normal Volumetric Hydrochloric Acid Solution until solution is complete, adding 2 drops of Methyl Orange Solution and titrating the excess of Normal Volumetric Acid Solution with Normal Volumetric Potassium Hydroxide Solution, the latter being added slowly with constant stirring, allowing the precipitated Oxide to redissolve before adding fresh portions. Not more than 5·5 c.c. of acid should be in excess. The number of c.c. of Normal Volumetric Potassium

Hydroxide Solution used is subtracted from 30, the difference represents the number of c.c. of Normal Volumetric Hydrochloric Acid Solution utilised in neutralising the Oxide. 1 c.c. of Normal Volumetric Hydrochloric Acid Solution corresponds to 4·04 p.c. of Zinc Oxide. The impurities mentioned under the heading of Zinc should be absent from the Oxide. It should answer the tests given in small type below under the headings of Ammonium Oxalate, Sodium Phosphate, Barium Nitrate and Silver Nitrate, indicating the absence of Calcium, Magnesium, Sulphates and Chlorides. The *U.S.P.* includes a test for limit of alkali which is described in small type below under the heading of Phenolphthalein; the figure given corresponds to 0·3 p.c. of anhydrous Sodium Oxide. The solubility in Ammonia referred to in the large type above is officially adopted as a test for the absence of metallic Zinc. The *U.S.P.* adopts the time-limit test for the detection of Arsenic; the *P.G.* employs the Bettendorf's test. Standards have been suggested (*C.D.* '08, i. 797) of 0·2 p.c. for Lead and 10 parts per million for Arsenic.

Ammonium Oxalate.—The clear, colourless liquid obtained by dissolving 1 part of Zinc Oxide in 10 parts by weight of Diluted Acetic Acid (*P.G.*), when supersaturated with Ammonia Solution should not be rendered turbid by T.S. of Ammonium Oxalate, *P.G.*

Sodium Phosphate.—Neither should this liquid be rendered turbid by T.S. of Sodium Phosphate, *P.G.*

Hydrogen Sulphide.—The same liquid with Hydrogen Sulphide poured on as a layer gives a pure white zone, *P.G.* Digest 1 gramme of Zinc Oxide with occasional agitation in a mixture of 10 c.c. of diluted Hydrochloric Acid and 10 c.c. of Water until saturated; then remove the undissolved Zinc Oxide by filtration. A portion of the filtrate acidulated with Hydrochloric Acid, should not respond to the time-limit test for Arsenic, Cadmium, Lead and Copper; in applying this test the Ammonia Water should be omitted, *U.S.P.*

Phenolphthalein.—If 1 gramme of Zinc Oxide be placed in a flask with 10 c.c. of boiling Water, and 2 drops of Phenolphthalein T.S. be added, not more than 1 c.c. of Tenth-normal Hydrochloric Acid Volumetric Solution should be required to discharge the red colour, *U.S.P.*

Barium Nitrate.—Let 2 grammes of Zinc Oxide be agitated with 20 c.c. of Water and the mixture filtered. The filtrate should not be rendered more than opalescent by T.S. of Barium Nitrate, *P.G.* A solution of 1 gramme in a sufficient quantity of diluted Nitric Acid should not become more than slightly turbid upon the addition of T.S. of Barium Chloride, *U.S.P.*

Silver Nitrate.—The filtrate obtained as in the last test should not be rendered more than opalescent by T.S. of Silver Nitrate, *P.G.* A solution obtained as in the last test should remain clear upon the addition of T.S. of Silver Nitrate, *U.S.P.*

Stannous Chloride.—A mixture of 1 gramme of Zinc Oxide and 3 c.c. of Stannous Chloride T.S. should not assume a dark colour in the course of an hour, *P.G.*

Preparation.

UNGUENTUM ZINCI. Zinc Ointment.

Add 3 of finely sifted Zinc Oxide gradually to 17 of Benzoated Lard, previously melted at a low temperature; stir until cold.

(1 in $6\frac{2}{3}$)

Official in Austr., 15 in 100; Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Russ., Span., Swed. and Swiss, 1 in 10; U.S., 1 in 5.

Not Official.

EMPLASTRUM ZINCI OXIDI (Aseptic).—Zinc Oxide, 20; Resin, 15; Japan Wax, 4; Benzoated Beef Tallow, 25; Anhydrous Wool Fat, 15; Washed Rubber, 8; Glycerin, 12; Methyl Salicylate, 0·6; Thymol, 0·4; all by weight.—*Y.P.B.* '07, 429; *C.D.* '07, ii. 178; *P.J.* '07, ii. 125.

GELATINUM ZINCI DURUM (*Unna*).—Dissolve Gelatin 15 and Glycerin 25 in Water 45. Rub down Zinc Oxide 10 with Glycerin 15, mix, and add sufficient Water to produce 100. All by weight.

Gelatinum Zinci.—Dissolve Gelatin 6 in Distilled Water 18; rub down Zinc Oxide 4 with Glycerin 11; add the Gelatin solution, and mix thoroughly. —*B.P.C. Formulary* 1901.

GLYCÉRÉ D'OXYDE DE ZINC.—Zinc Oxide, 1; Glycerin of Starch, 2. —*Fr.*

LASSAR'S PASTE.—Zinc Oxide, 24; Starch, 24; Salicylic Acid, 2; Soft Paraffin, 50. Used in eczema.

An unusual case of poisoning by absorption from use of Lassar's paste.—*L.* '04, i. 432.

This has been incorporated in the *B.P.C.* under the title Pasta Zinci Composita.

PASTA UNNA.—Gelatin, 15; Zinc Oxide, 10; Glycerin, 30; Water, 40. Melt, stir carefully, then add Ichthyol (Ammon.) 2 p.c.—*King's.*

Pasta Zinci et Ichthamolis.—Zinc Oxide, 10; Ammonium Ichthyosulphonate, 2; Gelatin, 16; Glycerin, 32; Distilled Water, *q.s.* to produce 100.—*B.P.C.*

PESSUS ZINCI.—Zinc Oxide, 15 grains; Mass (Glyco-gelatin), 20 grains.—*Women's.*

Pessus Zinci Oxidi.—Zinc Oxide, 15 grains; Oil of Theobroma, to 120 grains.—*B.P.C.*

PILULA ZINCI ET BELLADONNÆ.—Zinc Oxide, 2 grains; Extract of Belladonna (*B.P.* '85), ¼ grain; Extract of Gentian, *q.s.*—*Charing Cross.*

Pilula Zinci Oxidi et Belladonnæ.—Zinc Oxide, 2 grains; Alcoholic Extract of Belladonna, ¼ grain.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

PULVIS ZINCI OXIDI COMPOSITUS. *Syn.* Dusting Powder.—Zinc Oxide, 3; Salicylic Acid, in fine powder, 1; Starch, 12.—*Squire.*

Pulvis Zinci Oxidi et Acidi Salicylici.—Zinc Oxide, 4; Salicylic Acid, in fine powder, 1; Starch, 15.—*B.P.C.*

PULVIS ZINCI OXIDI ET ACIDI BORICI.—Zinc Oxide, Boric Acid, in powder, equal parts.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

PULVIS ZINCI OXIDI ET AMYLI.—Zinc Oxide, 1; Starch Powder, 1.—*St. Thomas's.*

This has been incorporated in the *B.P.C.*

PULVIS ZINCI ET CALOMELANOS.—Zinc Oxide, Mercurous Chloride, Tannic Acid, and Starch, of each 1.—*Westminster.*

PULVIS ZINCI OLEATIS COMPOSITUS (*Squire*).—Zinc Oleate, in fine powder, 20; Boric Acid, in fine powder, 70; finely powdered French Chalk, 10.

UNGUENTUM ZINCI CUM ACIDO SALICYLICO.—Salicylic Acid, 20 grains; Zinc Ointment, ½ oz.; Soft Paraffin, ½ oz.—*Middlesex.*

UNGUENTUM ZINCI STEARATIS.—Zinc Stearate, 50; White Petrolatum, 50. To the White Petrolatum, melted on a water-bath, add the Zinc Stearate, continue the heat until smooth, then stir while cooling, until it congeals.—*U.S.P.*

This has been incorporated in the *B.P.C.*

ZINC OLEAS (Shoemaker's).—Dissolve 180 grains of Zinc Acetate in 40 fl. oz. of cold Water; add slowly 20 fl. oz. of a **Solution of Sodium Oleate,** made by dissolving powdered Castile Soap, 1 oz. in 20 fl. oz. of Water; wash the precipitate with cold Water, collect and dry.

It forms a solid cake, easily powdered, and melting at about 79·4° C. (175° F.).

Solution of Sodium Oleate of the above strength is also used to precipitate Bismuth, Copper, and Lead Oleates.

ZINC OXIDE PLASTER MULLS (*Unna*).—Containing $\frac{1}{2}$ grain and 1 grain to the sq. in.

ZINC AND SALICYLIC PLASTER MULL (*Unna*).—Containing Zinc Oxide $\frac{1}{2}$ grain and Salicylic Acid $\frac{1}{4}$ grain to the sq. in.

ZINC GELATIN (*Unna*).—Zinc Oxide, 10; Gelatin, 10; Glycerin, 20; Water, 20.

This has been incorporated in the *B.P.C.*, under the title **Pasta Zinci et Gelatini,** giving the quantities respectively, 15, 15, 35, 35.

Not Official.

ZINCI PERMANGANAS.

Reddish-purple, crystalline, hygroscopic masses.

Solubility.—About 1 in 3 of Water, generally with a slight residue.

As an **injection** in chronic urethritis, 1 grain in 8 fl. oz. of Water.—*B.M.J.* '89, i. 1458.

Not Official.

ZINCI PHOSPHIDUM.

Minutely crystalline, friable fragments, or a greyish-black powder, containing about 24 p.c. of Phosphorus, corresponding to the formula Zn_3P_2.

Solubility.—Insoluble in Water or Alcohol (90 p.c.). Soluble in acids with evolution of Phosphuretted Hydrogen, which is not spontaneously inflammable.

Medicinal Properties.—Strongly recommended as a substitute for Phosphorus.

In hay fever.—*Pr.* lv. 205; *P.J.* '95, ii. 205.

Dose.—$\frac{1}{20}$ to $\frac{1}{4}$ grain = 0·0032 to 0·0162 gramme, given in **pill** with Milk Sugar and Glucose.

Foreign Pharmacopœias.—Official in Fr. (Phosphure de Zinc), Mex. and Span.

ZINCI SULPHAS.

ZINC SULPHATE.

$ZnSO_4.7H_2O$, eq. 285·41.

Fr., Sulfate de Zinc Officinal; Ger., Zinksulfat; Ital, Solfato di Zinco; Span., Sulfato Zincico.

Colourless, transparent, somewhat efflorescent, rhombic crystals, white acicular crystals or a granular crystalline powder. It should be kept in well-closed bottles.

Solubility.—10 in 7 of Water. Insoluble in Alcohol (90 p.c.).

Medicinal Properties.—Astringent; given with doubtful result in chorea, also in infantile diarrhœa; in large doses a prompt emetic. As an astringent **injection** in leucorrhœa and in the less acute stages of gonorrhœa; as a **collyrium** in conjunctivitis.

Dose.—1 to 3 grains = 0·06 to 0·2 gramme as a tonic; as an emetic, 10 to 30 grains = 0·65 to 2 grammes.

Ph. Ger. maximum single dose, 1·0 gramme.

Prescribing Notes.—*Tincture or Wine of Opium causes no precipitate with Solutions of Zinc.*

Incompatibles of Zinc salts are—Alkalis and their Carbonates, Lime Water, astringent vegetable Infusions or Decoctions and Milk.

Antidotes.—In case of poisoning with the salts of Zinc, Sodium Carbonate or Potassium Carbonate in large quantities dissolved in warm Water, Milk and Eggs freely, Tannic Acid or strong Tea, Laudanum, Linseed Meal Poultices to abdomen. If there is much pain in the abdomen, an enema of Gruel, or Starch and Water may be given.—*Murrell.*

Official Preparations.—Used in the preparation of Unguentum Zinci Oleatis, Zinci Carbonas, and Zinci Valerianas.

Not Official.—Buginarium Zinci Sulphatis, Injectio Sulphatum, Injectio Zinci Sulphatis, Lotio Rubra, Lotio Zinci Sulphatis, Collyre au Sulfate de Zinc, and Cadmii Sulphas.

Foreign Pharmacopœias.—Official in Austr., Belg., Dan., Dutch, Fr., Ger., Hung., Ital., Jap., Mex., Norw., Port., Russ., Span., Swed., Swiss and U.S.

Tests.—Zinc Sulphate melts when heated rapidly. At a temperature of 50° C. (122° F.) it loses 5 molecules of its Water of crystallisation, equivalent to 31·3 p.c.; at 100° C. (212° F.) the sixth molecule, equivalent to an additional loss of 6·3 p.c. or a total loss of 37·6 p.c. takes place; at a temperature of about 240° C. (464° F.) it parts with the remaining molecule of Water of crystallisation, equivalent to an additional loss of 6·3 p.c., or a total loss of 43·9 p.c. It dissolves readily in Water, forming a clear solution which is acid in reaction towards blue Litmus paper, and which yields the tests distinctive of Zinc given under that heading. The aqueous solution affords on the addition of Barium Chloride Solution a white precipitate insoluble in Hydrochloric Acid. Neither the *B.P.* nor the *P.G.* states a requisite percentage of pure crystallised Zinc Sulphate, nor is a method of determination indicated. The *U.S.P.* requires that in an unefflorescent condition it should contain not less than 99·5 p.c. of pure crystallised Zinc Sulphate, but gives no method of determination. The impurities mentioned under Zinc should be absent from the Sulphate. It should respond to the tests given in small type below under the headings of Litmus, Sodium Hydroxide, Silver Nitrate, Sulphuric Acid and Ferrous Sulphate, indicating the absence of free acid, Ammonium salts, Chlorides and Nitrates. A standard has been suggested (*C.D.* '08, i. 797) of 0·05 p.c. for Chloride, calculated as Zinc Chloride ($ZnCl_2$).

Litmus.—If 2 grammes of Zinc Sulphate be shaken with 10 c.c. of Alcohol (90 p.c.) and, after 10 minutes, filtered, the filtrate, diluted with 10 c.c. of Water, should not affect blue Litmus paper, *P.G.* If 1 gramme in small fragments be agitated with 10 c.c. of Alcohol (94·9 p.c.) for some time and filtered, the filtrate should not redden moistened Litmus paper, *U.S.P.*

Sodium Hydroxide.—Zinc Sulphate should not evolve Ammonia on the addition of T.S. of Sodium Hydroxide, *P.G.*

Hydrogen Sulphide.—The aqueous solution of Zinc Sulphate (1–20), after being acidulated with Hydrochloric Acid, should not respond to the time-limit test for Arsenic, Cadmium, Lead and Copper; in applying this test the addition of Ammonia Water should be omitted, *U.S.P.*

Silver Nitrate.—The aqueous solution (1–20) should not be rendered turbid by T.S. of Silver Nitrate, *P.G.*; not more than slightly turbid, *U.S.P.*

Sulphuric Acid and Ferrous Sulphate.—2 c.c. of an aqueous solution (1–10) of the salt, with 2 c.c. of Sulphuric Acid added and 1 c.c. of Ferrous Sulphate T.S. poured on as a layer, should not give a coloured zone, even on standing for some time, *P.G.*

Preparation.

UNGUENTUM ZINCI OLEATIS. Zinc Oleate Ointment.

Precipitate a solution containing 2 of Zinc Sulphate in 4 of Distilled Water with a solution of Hard Soap 4 in Distilled Water 40; wash the precipitated Oleate with hot Distilled Water until free from Sulphate; dry and mix with an equal weight of the Soft Paraffin, melted; stir until cold.

The Zinc Oleate is now made by precipitation instead of dissolving Zinc Oxide in Oleic Acid.

Not Official.

BUGINARIUM ZINCI SULPHATIS.—Zinc Sulphate, $\frac{1}{10}$ grain; Oil of Theobroma, 40 grains.—*Westminster.*

INJECTIO SULPHATUM.—Zinc Sulphate, Copper Sulphate, Ferrous Sulphate and Alum, of each 1 grain, Water to 1 fl. oz.—*Lock Hospital.*
This has been incorporated in the *B.P.C.*

INJECTIO ZINCI SULPHATIS.—Zinc Sulphate, 3 grains; Water 1 fl. oz.
For gonorrhœa and leucorrhœa.
This has been incorporated in the *B.P.C.*, as follows:—
Zinc Sulphate, 0·75; Distilled Water, *q.s.* to produce 100.

LOTIO RUBRA.—Zinc Sulphate, 2 grains; Compound Tincture of Lavender, 10 minims; Water, to 1 fl. oz. A stimulant to indolent ulcers.
This has been incorporated in the *B.P.C.*, as follows:—
Zinc Sulphate, 0·50; Compound Tincture of Lavender, 2; Distilled Water, *q.s.* to produce 100.

LOTIO ZINCI SULPHATIS.—Zinc Sulphate, 1 grain; Distilled Water, 1 fl. oz. Used in ophthalmia.—*London Ophthalmic.*

COLLYRE AU SULFATE DE ZINC.—Zinc Sulphate, 0·15; Rose Water, 100.—*Fr.*

Antiseptin is stated to be a mixture of Zinc Sulphate and Iodide, Thymol and Boric Acid.

Zinci Sulphis (Zinc Sulphite) is a white crystalline powder, sparingly soluble in Water. It has been used as a relatively non-toxic antiseptic for impregnating gauze and dressings.

CADMII SULPHAS.—Colourless crystals, readily soluble in Water, insoluble in Alcohol. Has been used as an astringent in the place of Zinc Sulphate.

Official in Fr., Mex. and Port.

ZINCI SULPHOCARBOLAS.

ZINC SULPHOCARBOLATE.

ZINC PHENOL-PARA-SULPHONATE.

$Zn(OH \cdot C_6H_4 \cdot SO_3)_2, 8H_2O$, eq. 551·55.

Colourless or almost colourless efflorescent rhombic crystals, sometimes possessing a faint Phenol odour and slightly pinkish tint.

The *B.P.* gives the formula for Zinci Sulphocarbolas with 1 molecule of Water of crystallisation. It is officially stated that it may be obtained by heating a mixture of Phenol and Sulphuric Acid, and saturating the product with Zinc Oxide. It has been pointed out in subsequent editions of the *Companion* that, prepared in this way, it will contain a quantity of Sulphate. The salt contains 8 molecules of Water of crystallisation. The *U.S.P.* describes the salt under the heading Zinci Phenolsulphonas or Zinc Phenolsulphonate.

It should be kept in well-closed glass bottles of a dark amber tint and exposed as little as possible to the air, as the salt effloresces and has a tendency to become pink on exposure to air.

It is extraordinary that the official monograph should describe the salt as 'efflorescent' when the official formula shows only 1 molecule of Water of crystallisation; as a matter of fact, the commercial salt contains 8 molecules of Water of crystallisation, and corresponds to the above formula.

Solubility.—1 in 2 of Water; 3 in 1 of boiling Water; 1 in 2½ of Alcohol (90 p.c.).

Greenish and Smith (*P.J.* '02, i. 552) give the solubility of the salt as 1 in 2·7 of Water and state that on consideration it might be thought that Zinc Phenol-para-sulphonate would be fairly stable, owing to the fact that it is a Para salt. The experiments made to determine whether the salt yielded a constant weight when dried at a given temperature not being satisfactory, the solubility was therefore determined gravimetrically by precipitating with Sodium Carbonate as usual and the result calculated for a salt of the official formula, ignoring, moreover, the fact that an amount of Zinc Oxide corresponding to even the 'assumed' official formula had not been obtained. The process would have worked admirably had the official formula been correct, but Squire and Caines (*C.D.* '02, ii. 945) have shown that the reason for their inability to obtain a constant weight was the incorrectness of their assumption regarding the pharmacopœial formula; the salt containing 8 molecules of Water of crystallisation and not 1. Greenish and Smith's figure (1 in 2·7) for Zinc Sulphocarbolate, as it should properly be understood, is incorrect, notwithstanding their subsequent statement (*P.J.* '03, ii. 947) that the solubility given is correct for a salt of this composition $Zn(OHC_6H_4SO_3)_2, H_2O$. If calculated figures are to be admitted as 'authoritative,' the percentage of Magnesium in, say, Magnesium Sulphate might with equal reason be determined by the usual method, and the solubility calculated for a salt containing 1 molecule of Water of crystallisation instead of 7, provided the official volume was sufficiently condescending to adopt an incorrect formula for the salt. By a curious oversight a misprint occurs in their second note on the solubility of Zinc Sulphocarbolate and Ammonium Phosphate. In giving their final conclusion that if the composition of the official salt is altered from 1 molecule of Water of crystallisation to 8, then the solubility of the salt must be proportionately increased, they have given the formula for the Mono-hydrated Zinc Sulphocarbolate as $Zn(OHC_6H_4SO_3)_2$, HO_2, instead of $Zn(OHC_6H_4SO_3)_2$, H_2O. The criticisms referring to the solubility figure for Ammonium Phosphate appear under the heading of Ammonii Phosphas.

Medicinal Properties.—Astringent and antiseptic.

For a **spray** to the throat, 5 grains to the oz. of Water; for a **nasal douche,** 2 grains to the oz. of Water; for **vaginal injection,** 60 grains in a pint of Water, for leucorrhœa or gonorrhœa.

Foreign Pharmacopœias.—Official in Austr. and Jap. (Zincum Sulphocarbolicum); Dutch (Sulphophenylas Zincicus); Russ. and Swiss (Zincum Sulfophenolicum); U.S. (Zinci Phenolsulphonas).

Tests.—Zinc Sulphocarbolate when heated to 100° C. (212° F.) loses 6 molecules of Water of crystallisation, equivalent to a loss of 19·45 p.c. At 125° C. (257° F.) it loses the remaining molecules of Water of crystallisation, equivalent to an additional loss of 6·48 p.c., or total loss of 25·93 p.c. When more strongly heated it chars, evolves an odour of Phenol and leaves a residue amounting to about 14·6 p.c. of the original weight. It dissolves readily in Water, forming a solution which is acid in reaction towards blue Litmus paper, and which then diluted yields with Ferric Chloride T.S. a violet colour and which answers the tests distinctive of Zinc given under that heading. The *B.P.* neither states a requisite percentage nor a method of determination. The *U.S.P.* requires that the uneffloresced crystals should contain not less than 99·5 p.c. of pure Zinc Paraphenol-sulphonate, but gives no method of determination. It may be determined gravimetrically by precipitating a weighed quantity of the salt, dissolved in a definite volume of Water, by the addition of Ammonium Carbonate Solution, filtering off the precipitated Zinc Carbonate, washing, drying, igniting and weighing as Zinc Oxide. 80·8 parts of Zinc Oxide correspond to 408·5 parts of anhydrous Zinc Sulphocarbolate or 426·39 parts of Zinc Sulphocarbolate of the *B.P.* formula with 1 molecule of Water of crystallisation, or to 551·55 parts of crystallised Zinc Sulphocarbolate of the correct formula with 8 molecules of Water of crystallisation. The impurities mentioned under Zinc should be absent from this salt. It should conform to the tests given below under the headings of Barium Chloride, Silver Nitrate, and modified Gutzeit's test, indicating the absence of Sulphates, Chlorides, and Arsenic.

Time-limit Test.—The aqueous solution of the salt (1–20) to which 1 c.c. of diluted Hydrochloric Acid has been added, should not respond to the time-limit test for Arsenic, Cadmium, Lead and Copper; in applying this test the addition of Ammonia Water should be omitted, *U.S.P.*

Barium Chloride.—The aqueous solution of the salt (1–20) should not become turbid upon the addition of T.S. of Barium Chloride, *U.S.P.*

Silver Nitrate.—A similar solution should not become turbid upon the addition of T.S. of Silver Nitrate, *U.S.P.*

Gutzeit's Test.—5 c.c. of an aqueous solution of the salt (1–10) should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

ZINCI VALERIANAS.

ZINC VALERIANATE.

ZINC-ISO-VALERIANATE.

$Zn(C_5H_9O_2)_2 2H_2O$, eq. 301·29.

FR., VALÉRIANATE DE ZINC; GER., ZINKVALERIANAT; ITAL., VALERIANATO DI ZINCO; SPAN., VALERIANATO ZINCICO.

White lustrous pearly scales, having a strong odour of Valerianic Acid and a sweetish astringent metallic taste.

It should be kept in well-stoppered bottles, as when exposed to the air it slowly loses Valerianic Acid. The *B.P.* gives the formula for the anhydrous salt; the salt really contains 2 molecules of Water of crystallisation; the *U.S.P.* gives the formula with 2 molecules of Water of crystallisation. The official method of preparation is by saturating Iso-valerianic Acid with Zinc Carbonate, or by the interaction of Zinc Sulphate and Sodium Iso-valerianate.

Solubility.—1 in 120 of Water; 1 in 60 of Alcohol (90 p.c.); 1 in 500 of Ether.

Medicinal Properties.—Antispasmodic and nervine tonic, used in various neuralgic and hysterical affections, and sometimes in chorea.

In hay fever.—*B.M.J.* '96, i. 967.

Dose.—1 to 3 grains = 0·06 to 0·2 gramme.

Incompatibles.—All acids, soluble Carbonates, most metallic salts and vegetable astringents.

Not Official.—Pilula Valerianæ Composita, and Pilula Zinci Valerianatis.

Foreign Pharmacopœias.—Official in Dutch, Fr., Hung., Ital., Jap., Mex., Port., Russ., Span., Swed. and U.S.

Tests.—Zinc Valerianate when heated melts, and at a higher temperature is decomposed, evolving inflammable vapours, and leaving a residue of Zinc Oxide which when dissolved in Diluted Hydrochloric Acid should answer the tests distinctive of Zinc given under that heading. It dissolves sparingly in Water, forming a solution which possesses an acid reaction towards blue Litmus paper. The *U.S.P.* states that it should dissolve without residue in Ammonium Carbonate T.S. 0·5 of a gramme of the salt when dissolved in a mixture of 0·5 c.c. of Hydrochloric Acid and 9 c.c. of Water yields a liquid from which the Iso-valeric Acid separates and floats as an oily layer. The *B.P.* does not state a requisite percentage of pure Zinc Valerianate, but gives a method of determination, stating that it should yield not less than 26 nor more than 30 p.c. of Zinc Oxide. The theoretical percentage of Zinc Oxide is 26·8, in the salt containing 2 molecules of Water of crystallisation ; in the salt of the present official formula it is 30·4 p.c. A number of commercial samples yielded from 21 to 64 p.c. of Oxide and suggested a minimum standard of 26 p.c. All the samples examined showed Butyric Acid by the Copper test. The commercial 'præcip.' generally contains a quantity of Oxide, but pure samples can occasionally be obtained.

The *U.S.P.* states that the salt should contain not less than 99 p.c. of pure Zinc Valerate ($2H_2O$), but gives no method of determination. The salt should not contain the impurities mentioned under Zinc. When testing for Butyric Acid the *B.P.* tests the distillate with Copper Acetate Solution ; the *U.S.P.* tests the concentrated aqueous solution of the salt with a concentrated Copper Acetate Solution by the test described in small type below under the heading of Copper Acetate. The salt should answer the tests given in small type below under the headings of Silver Nitrate, Barium Chloride, Ferric Chloride and modified Gutzeit's test.

Time-limit Test.—If 0·5 gramme of the salt be dissolved in a mixture of 0·5 c.c. of Hydrochloric Acid and 9 c.c. of Water, the Valeric (Iso-Valeric) Acid will be liberated and float as an oily layer on the surface of the liquid. After filtering through a wetted filter, the clear solution should not respond to the time-limit test for Arsenic, Cadmium, Lead and Copper; in applying this test the addition of Ammonia Water should be omitted, *U.S.P.*

Barium Chloride.—If 0·5 gramme be dissolved in a mixture of 0·5 c.c. of Nitric Acid and 4·5 c.c. of Distilled Water and the mixture filtered through a small wetted filter, the filtrate should show but a faint cloudiness upon the addition of T.S. of Barium Chloride, *U.S.P.*

Silver Nitrate.—A similar filtrate should show but a faint cloudiness upon the addition of T.S. of Silver Nitrate, *U.S.P.*

Ferric Chloride.—If 0·5 gramme be triturated with 3 c.c. of Water, and 0·2 c.c. of Ferric Chloride T.S. added, the filtrate should not show a red colour, *U.S.P.*

Copper Acetate.—This T.S. should not immediately affect the transparency of the distillate obtained on heating the salt with Diluted Sulphuric Acid. Oily drops are formed after the lapse of a little time, and these gradually pass into a bluish-white crystalline deposit, *B.P.* A mixture of a concentrated solution of Copper Acetate in Water and a concentrated aqueous solution of the salt should remain perfectly clear, *U.S.P.*

Gutzeit's Test.—If 0·5 gramme of the salt be heated with a mixture of 9·5 c.c. of Distilled Water and 0·5 c.c. of Hydrochloric Acid and filtered, the filtrate should not respond to the modified Gutzeit's test for Arsenic, *U.S.P.*

Not Official.

PILULA VALERIANÆ COMPOSITA.—Zinc Valerianate, Iron Valerianate and Quinine Valerianate, of each 1 grain.—*Samaritan.*

This has been incorporated in the *B.P.C.* under the title **Pilulæ Ferri Valerianatis Compositæ,** *syn.* Pilulæ Trium Valerianatum.

PILULA ZINCI VALERIANATIS.—Zinc Valerianate, 1 grain ; Compound Pill of Asafetida, 2 grains.—*Throat* and *St. Thomas's.*

This has been incorporated in the *B.P.C.*

ZINGIBER.

GINGER.

Fr., Gingembre; Ger., Ingwer; Ital., Zenzero; Span., Rizoma de Jengibre.

The scraped and dried Rhizome of *Zingiber officinale*, Roscoe.

From plants cultivated in the West Indies, India, and other countries.

Medicinal Properties.—Aromatic stimulant and carminative. It is given in atonic dyspepsia, flatulence, and as a corrective adjunct to purgative medicines.

Official Preparations.—Syrupus Zingiberis, and Tinctura Zingiberis; used in the preparation of Infusum Sennæ, Pilula Scillæ Composita, Pulvis Cinnamomi Compositus, Pulvis Jalapæ Compositus, Pulvis Opii Compositus, Pulvis Rhei Compositus, Pulvis Scammonii Compositus. Contained in Mistura Sennæ Composita, Pilula Aloes et Ferri, and Pilula Cambogiæ Composita. The **Tincture** is used in the preparation of Acidum Sulphuricum Aromaticum, Liquor Sennæ Concentratus, Pilula Scammonii Composita, and contained in Infusum Cinchonæ Acidum.

Not Official.—Tinctura Zingiberis Fortior, and Oleoresina Zingiberis.

Foreign Pharmacopœias.—Official in all; Fr., Gingembre; Ital., Zenzero; Port., Gengibre; Mex. and Span., Jengibre.

Descriptive Notes.—The rhizome of Ginger comes into commerce in several forms, which are either coated, partially scraped, or entirely scraped, and in some varieties washed with Milk of Lime. The last are termed bleached.

The rhizome differs in being either starchy and brittle with a fibrous fracture, or hard and resinous and rather tough, also in the degree of pungency and flavour.

The bleached Jamaica Ginger is considered to be the best for flavour, and the Cochin next; that of Fiji, which is rare in commerce, has a characteristic lemon flavour. The West African Ginger, although inferior in appearance and in smaller pieces, is often superior in pungency. The pieces, which are known technically as races or hands, are in the finer Jamaica and Cochin varieties branched laterally, about 3 in. (75 mm.) long, the branches being compressed, more or less oval, and contracted below, and at the rounded end exhibiting a depression corresponding to the base of the leafy stem. The scraped surface is of a pale buff colour and fibrous appearance, the taste hot and pungent and the flavour characteristic.

In some specimens of Ginger the appearance is horny throughout, owing to the root having been scalded before drying, but usually it is mealy towards the apices, even when resinous below. Its odour is due to $\frac{1}{4}$ p.c. of a volatile Oil, but its pungency to an oily body named Gingerol.

An inferior variety known as Ratoon Ginger is sometimes imported from the West Indies; it consists of the younger shoots, which are generally kept for propagating the plant. Japanese Ginger is occasionally imported, it has a greyish fracture, occurs in smaller pieces and is apparently derived from a different species.

Powdered Ginger is characterised by the cells containing resin, by the pyriform compressed starch grains 12 to 40 μ long, appearing linear when seen laterally, having the hilum at the smaller end, by the thin-walled polygonal parenchymatous cells, and the sometimes septate bast fibres with irregularly nodose extremities.

Tests.—Ginger yields when genuine and unbleached from 3 to 4 p.c. of ash, and 5 p.c. should not be exceeded. It yields not less than 1·5 p.c. of soluble ash. The extractive matter soluble in cold Water is usually about 10 p.c., and should not be less than 8·5 p.c.; the extractive matter soluble in Alcohol (90 p.c.) usually amounts to about 5 p.c., and should not be materially below this figure.

Preparations.

SYRUPUS ZINGIBERIS. SYRUP OF GINGER.

1 of Ginger (in the form of strong Tincture 1 in 2); Syrup *q.s.* to yield 40. (1 of Ginger in 40)

Dose.—$\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c.

Official in Jap., 1 of Tincture in 10; Swed., 1 (rhizome) in 20, by weight; U.S., 3 (Fluid Extract) in 100.

TINCTURA ZINGIBERIS. TINCTURE OF GINGER.

1 of Ginger in No. 40 powder, percolated with Alcohol (90 p.c.) to yield 10. (1 in 10)

Dose.—$\frac{1}{2}$ to 1 fl. drm. = 1·8 to 3·6 c.c.

Official in Belg., Ger., Hung., Ital., Jap., Mex., Port., Swiss and U.S., 1 in 5; all by weight except U.S.

Tests.—Tincture of Ginger has a sp. gr. of 0·835 to 0·840; it contains about 0·5 p.c. w/v of total solids and about 88 p.c. w/v of Absolute Alcohol.

Not Official.

TINCTURA ZINGIBERIS FORTIOR. *Syn.* Essence of Ginger (*B.P.* '85).—Ginger percolated with Alcohol (90 p.c.) to form 1 in 2.

Dose.—5 to 20 minims = 0·3 to 1·2 c.c.

Squire's **Essence of Ginger** has always been twice the above strength.

By repercolation a Fluid Extract 1 in 1, or even 2 in 1, can be readily prepared.

U.S. has Fluidextractum Zingiberis 1 in 1 with Alcohol (95 p.c.).

OLEORESINA ZINGIBERIS (*U.S.*). *Syn.* Gingerine.

Ginger, in No. 60 powder, exhausted by percolation with Acetone and evaporation.

Should be kept in a well-stoppered bottle.

CINCHONÆ RUBRÆ CORTEX.

QUINQUINA ROUGE (*Fr.*)

DETERMINATION OF TOTAL ALKALOIDS AND QUININE.

Process of the *French Codex* (1908).

THE amount of total alkaloids and crystallised basic Quinine Sulphate containing 8 molecules of Water of crystallisation, which the bark official in the new *Fr. Codex* is required to yield, are briefly referred to on p. 382 under the comparison of the respective requirements of the more important Pharmacopœias. This section of the work was too far advanced to enable the lengthy process to be introduced under the heading of Cinchona, and it is included here in view of the interest attaching to the subject.

Tests.—The time available for a trial of the undermentioned process has necessarily been short, but so far as it is possible to judge, except for the difficulty involved in manipulating such large quantities of solvents of so volatile and inflammable a nature, the process works well. If the solvents are not subsequently recovered by distillation, the process is not economical. The essential details of the process are as follows: A sample of the bark, amounting to about 50 grammes, is powdered and the powder passed through a No. 45 sieve. The amount of moisture is determined on a weighed quantity of 0·5 of a gramme, drying the powder at 100° C. (212° F.). The bark under examination lost at this temperature moisture equivalent to 8·6 p.c., so that 100 parts of the original powdered bark may be considered as equivalent to 91·4 parts of the dried and powdered bark. A weighed quantity of 30 grammes of the dried and powdered bark is introduced into a wide mouth well-stoppered bottle of about 1 litre capacity, and a previously prepared mixture of 35 c.c. of Ammonia Solution (10 p.c. w/w) and a sufficient quantity of Alcohol (95 p.c.) to produce a volume of 180 c.c. is poured upon it; the mixture is allowed to stand for 1 hour, shaking from time to time and 720 c.c. of Ether then added. The stopper of the bottle is securely tied in by the aid of string passed round the neck of the bottle, the contents are briskly shaken and allowed to remain at rest for 6 hours with intervals of frequent shaking, the liquid is filtered through a plaited filter paper contained in a covered funnel, and a measured quantity of 750 c.c. of the solution (= 25 grammes of the dried and powdered bark) is removed. The whole of the Ether is distilled, evaporation being conducted several times in a flask of 500 c.c. capacity and away from all naked flames, the flask being simply plunged into warm Water. After the Ether is completely distilled the evaporation is continued until a portion of the Alcohol is also removed, the liquid is transferred to a flask of 125 c.c. capacity and the distillation continued until nothing further passes over. The last traces of Alcohol are removed by immersing the flask up to the neck in almost boiling Water in a water-bath, the residue which is generally sticky and coloured owing to the alkaloids being impure is dissolved in 40 c.c. of Diluted Sulphuric Acid, after previously adding a small quantity of Water, solution being effected by gently warming the mixture on a water-bath and then allowing the solution to cool, when the acid solution is filtered through an unplaited filter and collected in a glass separator of 250 c.c. capacity. A measured quantity of 125 c.c. of Chloroform is introduced, followed by a sufficient quantity of dilute Ammonia Solution to liberate the alkaloids and to produce a distinct ammoniacal odour; the addition of the Ammonia produces a considerable reddish-brown deposit, colouring matter, etc., which holds a large amount of the Chloroform in suspension necessitating filtration through a plug of cotton-wool, under pressure, and the washing of this precipitate to free it from retained alkaloids. The chloroformic solution of the alkaloids is separated, transferred to a flask and the treatment of the ammoniacal solution in the separator twice repeated, using in each instance 125 c.c. of Chloroform. The mixed chloroformic solutions are separated in each instance, washed with 10 c.c. of Water, allowed to separate and the aqueous washings rejected. The chloroformic solution is distilled in such a manner that 200 c.c. of liquid remain, the chloroformic liquid is transferred, after cooling, to a flask graduated at 250 c.c. The flask in which the distillation has been conducted is washed with a few small quantities of Chloroform, and the washings transferred to the graduated flask and diluted with sufficient Chloroform to bring the volume to 250 c.c., they are then thoroughly mixed. A measured quantity of 50 c.c. (= 5 grammes of the dried and powdered Cinchona bark) is removed and evaporated to dryness in a conical flask of 90 c.c. capacity, the residue is dried at 100° C. (212° F.) and weighed, the weight of the residue multiplied by 20 yields the amount of alkaloids contained in 100 grammes of powdered Cinchona bark, and this weight should not be less than 5 grammes. In the experiment under consideration the amount of total alkaloid amounted to 8·8 p.c. and was fairly highly coloured. When titrated with Normal Volumetric Hydrochloric Acid Solution, using Hæmatoxylin Solution as an indicator of neutrality and calculating the result with a factor for anhydrous Quinine it indicated 5·78 p.c. of alkaloids.

Determination of Quinine.—The Chloroform is removed by distillation from the remaining 200 c.c. of the above Chloroform solution of the total alkaloids, the syrupy residue is treated with 50 c.c. of Ether which is dropped on a little at a time, the Cinchonine and the greater part of the Cinchonidine will be precipitated in a crystalline condition. When the precipitate has settled down, the ethereal solution is decanted into a flask, the crystals washed by decantation with 75 c.c. of Ether, used in 3 portions; the ethereal solutions of Quinine in the flask are mixed, almost the whole of the Ether distilled and the liquor so concentrated is transferred to an evaporating dish and allowed to evaporate spontaneously, the Ether washings are also transferred to the dish previous to evaporation. The almost colourless sticky residue is dissolved in 20 c.c. of Sulphuric Acid Solution (2 p.c. w/w) by warming on a water-bath until solution is completed; dilute Ammonia Solution is added little by little to the warm limpid solution until the precipitate at first formed ceases to redissolve. The liquid will now be slightly turbid and alkaline, and 5 p.c. w/w Sulphuric Acid Solution is added carefully drop by drop until the liquid, now rendered limpid, yields a very faintly acid reaction towards blue Litmus paper, the volume should be about 15 c.c. which should be cooled and allowed to crystallise during 12 hours in a cool place, the crystals collected on a porcelain dish of 20 mm. diameter pierced with a hole which should be covered with a circle of flannel with a diameter a little bit larger than the hole; the complete apparatus being placed in a very small filter, which has been previously moistened with Distilled Water. The crystalline Sulphate is transferred to the funnel washed with 6 c.c. of Distilled Water, used in 3 separate portions and which have previously served to wash out the evaporating basin in which the crystallisation was effected. The funnel is inverted over a piece of white filter paper, the basic Quinine Sulphate in the shape of a compact cake is detached and dried in the air; when the drying has proceeded sufficiently far the circle of flannel is separated, which will be found to be cleanly effected without retention of the product, the cake of Sulphate is placed in a watch-glass, at the same time transferring any particles which may have adhered to the flannel, and complete desiccation is effected at a temperature of 100° C. (212° F.) until of constant weight. The Sulphate should be weighed between 2 watch-glasses held together by means of a metal clip, the whole having been previously weighed. The weight of Sulphate obtained should not be less than 0·251 gramme, which corresponds to 1·257 grammes of basic Quinine Sulphate (dried at 100° C. (212° F.)), or to 1·092 grammes of anhydrous Quinine in 100 grammes of the dried and powdered bark. This is equivalent to a yield of not less than 1·5 p.c. of basic Quinine Sulphate $(C_{20}H_{24}N_2O_2)_2\ H_2SO_4\ 8H_2O$, to 1·257 p.c. of basic Quinine Sulphate dried at 100° C. (212° F.), or to 1·092 p.c. of anhydrous Quinine from the dried and powdered bark. The crystallised basic Sulphate of Quinine obtained in the experiment in question was of good crystalline appearance, and was practically free from colour. The percentages calculated on the dried and powdered bark corresponded to 4·08 p.c. of basic Quinine Sulphate $(C_{20}H_{24}N_2O_2)_2\ H_2SO_4\ 8H_2O$, eq. to 3·425 p.c. of basic Quinine Sulphate dried at 100° C. (212° F.), or to 2·97 p.c. of anhydrous Quinine.

Not Official.

THERAPEUTIC AGENTS OF MICROBIAL ORIGIN.

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THERAPEUTIC SERA.

Syn.—ANTITOXINS, OR ANTI-SERA.

These are obtained by treating an animal with subcutaneous or intravenous injections of increasing doses of (*a*) bacterial toxins, (*b*) bacterial cultures, living or killed, (*c*) a combination of *a* and *b*, then bleeding the animal, allowing the blood to coagulate, drawing off the serum and bottling this in the fluid state or after drying *in vacuo*; all these operations being carried out under the strictest aseptic precautions. To the fluid serum a small quantity of an antiseptic is usually added, and each bottle or vial generally contains a single dose only. The dried serum should be in the form of thin scales or fine powder, otherwise it is difficult to dissolve; for use each gramme (corresponding to about 10 c.c. of fluid serum) of the solid is dissolved in 5 to 10 c.c. of cool Distilled Water (not above 40° C. = 104° F.), previously sterilised by boiling.

Two classes of anti-sera may be distinguished: one prepared by method *a*, with bacterial toxins, to which the term 'antitoxin' is alone strictly applicable (*e.g.*, diphtheria and tetanus antitoxins), the other prepared by method *b*, and termed anti-microbic, or simply anti-sera (*e.g.*, anti-streptococcic, anti-plague, and anti-pneumonic sera).

The last named are much less potent than the antitoxins, and attempts have been made to reinforce their action by the simultaneous injection of fresh normal serum, but without much success.

It is customary in some instances to employ several strains of the organism in the preparation of the serum; such sera are termed 'polyvalent.' The subject of serum treatment is fully dealt with in Hewlett's 'Serum Therapy.'

The therapeutic sera in most instances retain their activity for several weeks at least if kept in a cool, dark place—preferably an ice-safe: diphtheria and tetanus antitoxins probably for nearly a year, the anti-microbic sera for a much shorter period. They should not be administered with any other substance, must not be heated, and a bottle of the fluid having once been opened, any fluid not used at the time should be discarded. The dried products are preferable in hot climates.

The dose of therapeutic sera corresponds usually to 5 to 20 c.c. of the fluid serum, according to the activity, which is estimated by ascertaining the amount of serum required to neutralise a given amount of toxin or culture. The dose depends on the gravity of the disease and not on the age of the patient. Symptomatic treatment on general principles should be employed in addition to the anti-serum.

The therapeutic sera are administered by subcutaneous injection, in the abdomen or between the scapulæ, the skin having been previously disinfected with an antiseptic lotion and the syringe by boiling for five minutes. Or, if an immediate effect be desired, by intravenous injection into a superficial vein, the serum being warmed by standing the bottle in warm Water (35° to 40° C. = 95° to 104° F.) and strained through a piece of fine muslin, sterilised by boiling, if there be any deposit. Care must be taken that no air is injected. Intra-muscular injections are more quickly absorbed than subcutaneous ones. Early treatment is of the utmost importance.

Some clinicians assert that antitoxins and anti-sera exert their action when administered by the mouth or rectum. Hewlett, however, was unable to detect any absorption of tetanus antitoxin when given in this way to rabbits, and Sternberg similarly no absorption of diphtheria antitoxin.—*Wien. klin. Wochr.* 1908, p. 709.

The therapeutic sera are specific, *e.g.*, diphtheria antitoxin is of use only in diphtheria; carefully administered they are harmless, but cutaneous eruptions or joint pains may follow, for the treatment of which Calcium Chloride is of service.

A second injection of serum at an interval of 10 to 40 days after the first one may be followed by immediate and serious symptoms ('supersensitation,' *see* Goodall, *Jour. of Hyg.* vii. 1907, p. 607). But the continuous use of a serum for some days does not produce this effect.

The anti-sera may be used as prophylactics (dose 10 to 20 c.c. subcutaneously), but the immunity produced does not last longer than three weeks.

DIPHTHERIA ANTITOXIN.—Anti-diphtheritic serum is official in the *Ph. Ger.* Both a liquid and a solid antitoxin are described, the former as a yellowish, transparent fluid, having the odour of the preservative agent, and with at most a slight sediment, the latter is a yellowish-white powder, or yellow transparent lamellæ, which, by the addition of 10 parts of Water, dissolves to a liquid corresponding in colour and general appearance to the liquid diphtheria antitoxin.

The sizes of the liquid diphtheria antitoxin mostly used are No. 0, 200 immunisation units; No. 1, 500 to 600 immunisation units; No. 2, 1000 immunisation units; No. 3, 1500 immunisation units.

The solid diphtheria antitoxin is required to contain at least 5000 immunisation units per gramme.

The *Ph. Ger.* also stipulates that antitoxin, with marked permanent turbidity or thick deposit, as well as serum of a prohibited test-number, is not permitted to be sold in pharmacy.

It should be protected from the light and stored in a cool place.

The therapeutic value is reckoned in Ehrlich units, 1 unit being that amount of serum which will completely neutralise about 100 lethal doses of toxin in a medium-sized guinea-pig.

The method of standardisation is a very exact one, devised by Ehrlich, but is too complicated to explain here. The different makes are of different strengths, *i.e.*, contain a variable number of units in a given volume. The dosage is always referred to in units.

The dosage varies with the severity of the attack, and with the lapse of time after the onset before treatment is commenced. In a mild case, coming under observation on the first day, a single dose of 4000 units may suffice, but is best repeated on the next day. In severe cases the 4000 units should be repeated every 4 hours for 3 or 4 doses, and repeated the next day if necessary. In bad cases, coming under observation late, 8000 to 30,000 units have been recommended, followed by smaller doses, every 3 or 4 hours. In such cases Cairns considers that valuable time is saved by giving the primary dose intravenously. If there be a reasonable suspicion that the case is diphtheritic no time should be lost in giving antitoxin. The guide to the administration of subsequent doses is the general condition and the appearance of the membrane; this when the patient is fully under the influence of antitoxin appears to melt away.

The prophylactic dose should not be less than 500 units.

Several preparations by different makers can be obtained.

Diphtheria antitoxin, *re* the intravenous injection, even in cases other than laryngeal, it seems difficult to say (*L.* '04, ii. 1776) of an individual patient that a better result was obtained by this method than might have followed subcutaneous injection.

TETANUS ANTITOXIN.—If the case be seen immediately upon the development of the premonitory symptoms (stiffness, etc., of the facial muscles), 25 to 30 c.c. of the serum may be injected subcutaneously, followed by an injection of 10 c.c. every 8 hours as long as the symptoms last. If any time has elapsed since the development of the premonitory symptoms, 10 c.c. should be administered intravenously and 20 c.c. subcutaneously, followed by 10 c.c.

subcutaneously every 8 hours as before. But if the case has lasted any length of time, and especially if spasms have already occurred, no time should be lost in giving the antitoxin by cerebral or spinous inoculation (*see infra*).

Dried and pulverised tetanus antitoxin has been recommended as a dressing for wounds soiled with earth, etc.

For prophylactic use 3 doses of 10 c.c. should be injected at intervals of a fortnight.

In veterinary practice, 20 to 40 c.c. may be injected every 12 to 24 hours, but unless the animal be a valuable one the cost of the treatment is prohibitive.

Since Tetanus Toxin becomes fixed in the cells of the central nervous system, and antitoxin is but slowly absorbed from the subcutaneous tissues, it is desirable, in order to obtain a maximum and rapid response, to inject the antitoxin so that it may at once come in contact with the nerve tissues. This may be done by (*a*) intra-cerebral, into the cerebral hemispheres, (*b*) intra-ventricular, into the lateral ventricles, (*c*) intra-spinous, by lumbar puncture, inoculation. A primary dose of 5 c.c. of tetanus antitoxin of double strength (*i.e.*, 1 gramme of the solid dissolved in 5 c.c. of Water) may thus be administered, subsequent doses being given subcutaneously. As tetanus toxin is absorbed along the nerve trunks, antitoxin may be injected in addition into nerves if the site of the wound permit.

A method given by Roux and Borrel.—*T.G.* '98, 773.

A method given by Semple.—*B.M.J.* '99, i. 10.

10 c.c. doses, given intradurally in a case of tetanus, were followed by recovery.—*B.M.J.* '04, ii. 1696.

ANTI-VENENE.—An antitoxin prepared by the injection of snake venom. A separate serum is required for every venom, so that this antitoxin must have a limited use. That prepared by Calmette, of Lille, is mainly antidotal for the venom of the cobra. At least 30 to 40 c.c. should be injected at the earliest possible moment; if any interval has elapsed since the bite, 10 c.c. should be given intravenously in addition.

Antivenomous sera have been shown (*L.* '04, ii. 1277) to be markedly if not absolutely specific, even between the venoms of species of the same genus. The only sera at present in practical use are Calmette's and one prepared at the Pasteur Institute of India with pure cobra venom. Both are specific for cobra venom. The neutralising power is low, and 300 to 400 c.c. may be necessary even when given intravenously, and 10 or 20 times this amount if given subcutaneously.

ANTI-STREPTOCOCCIC SERUM.—The dose is 10 to 20 c.c. every 12 or 24 hours. Some Continental authorities regard this amount as much too small, and administer 50 to 150 c.c. for a dose.

N.B.—Streptococcic serum rapidly diminishes in strength with age, and should not be kept.

Is of especial value in erysipelas. Some cases of septicæmia react well to it, in others apparently similar it has little effect. Cases of septicæmia may be due to a variety of organisms, but it is only in pure streptococcic infections that the serum can be expected to have any effect. Even in streptococcic infections it is not always efficacious; there seem to be many varieties of streptococci, and a serum prepared with one variety may have little or no antidotal action towards another variety. The serum should be a 'polyvalent' one, *i.e.*, prepared with several varieties or strains.

The use of a serum prepared from a horse which has been immunised against a variety of strains has been recommended (*L.* '04, ii. 1829); the commencing dose being at least 20 c.c., and repeated, if necessary, at least every 24 hours. Useless to persist in the administration of any particular serum unless its beneficial action is almost immediately apparent.

The serum is innocuous if carefully prepared and injected with due precaution. (2) It must be administered early in the disease, and in large doses – 20 c.c.—twice in 24 hours in severe cases. (3) If administered early and in large doses, definite improvement is observed in a considerable proportion of cases.—*B.M.J.* '05, i. 584.

The most rational method of dosage (*L.* '04, ii. 1832) would seem to be that of a large injection on the first occasion, followed by smaller doses as case may require. More uniform results are obtained with polyvalent sera.

In a simple septicæmia or sapræmia good results can be obtained with the anti-streptococcic serum.—*L.* '04, ii. 1213.

Fenwick recommends rectal injections of polyvalent anti-streptococcic serum in gonorrhœa, gonorrhœal pyæmia, rheumatism and hæmorrhagic purpura.—*B.M.J.* '06, i. 979.

A prophylactic injection recommended by Cheyne previous to operations about mouth and throat.

ANTI-ANTHRAX SERUM.—Prepared by immunising asses with killed and living cultures of *B. anthracis.* Sclavo's is that generally employed, dose 50 c.c.

A successful case, *B.M.J.* '05, ii. 118.

ANTI-PNEUMOCOCCIC SERUM.—The dose is 20 to 30 c.c. subcutaneously twice daily until the crisis. If the case be seen *early*, this serum may be very useful in the case of debilitated, aged, or alcoholic patients. Pane's serum seems to be the most potent.

Washbourn, *B.M.J.* '97, i. 510; ii. 1849; and Eyre, *ib.* '99, ii. 1247; Wilson, *Jour. Amer. Med. Assoc.* 1900 (Sep.), 595; Tyler, *ib.* 1901 (June), 1540.

ANTI-PLAGUE SERUM.—Yersin's serum is that generally employed. Calmette recommends 20 c.c. intravenously to be given immediately, followed by two subcutaneous doses of at least 40 c.c. each during the first 24 hours, and subsequently 10 to 40 c.c. daily, according to the condition of the patient. Choksy and also Cairns recommend still larger doses (60, 80, 100, 200 c.c.). The prophylactic dose is 10 c.c. subcutaneously.

Calmette, *Ann. de l'Inst. Pasteur*, xiii. '99, 865; Cairns, *L.* '03, i. 1287.

ANTI-TYPHOID SERUM.—No satisfactory serum seems to have been prepared as yet. The sera on the market are anti-microbic; dose 10 to 20 c.c. Chantemesse has prepared a serum, the use of which he claims gives good results.

Chantemesse, *La Presse Méd.* '02, No. 103, 122; *Trans. XIV. Internat. Congress Hygiene*; Macfadyen, *B.M.J.* '03, i. 681.

Anti-typhoid serum is stated (*B.M.J.* '04, ii. 1269) to exercise a specific action on the diseases of the organism. If the nervous system is deeply poisoned, the benefit is much smaller, and failures occur. In the treatment of a large number of cases during several years, Chantemesse shows a mortality of 4 p.c., and claims (*B.M.J.* '04, ii. 1449) to have produced a serum with which remarkable success is stated to have been obtained. The serum is given in small doses (4 to 5 m.), and Wright believes that it contains a *toxin* and is in reality a *vaccine* (Chantemesse agrees with this view). In the case of typhoid fever (*B.M.J.* '04, ii. 1449), the serum of a horse, after repeated inoculations with the virus, though possessed of anti-bacterial properties, is found to be practically devoid of any antitoxic value.

ANTI-TYPHOID EXTRACT OF JEZ.—Prepared from the tissues of immunised rabbits. Dose, 2 drm., *by the mouth* every 1 to 2 hours until temperature becomes remittant.

See B.M.J.E. '01, i. 51; '02, i. 27.

ANTI-TUBERCLE SERUM.—Paquin and Maragliano have each prepared an anti-tubercle serum.

Dr. Marmorek has obtained a new tuberculous serum by growing the young bacilli in a medium consisting of leucotoxic calf serum and Glycerin liver bouillon. In pulmonary tuberculosis he claims, by the use of this antitoxin, to have produced amelioration, and even definite cures. In pleurisy there was a rapid diminution of the effusion.—*B.M.J.* '03, ii. 1434, '06, i. 340; *L.* '03, ii. 1470, 1642, 1746.

Not very favourably reported on. *B.M.J.* '01, ii. 1621; *L.* '03, ii. 1695.

The dose for rather chronic cases is ordinarily 5 c.c., whilst in acute cases, such as meningitis, as much as from 20 to 30 c.c. in divided doses may be given every day for 4 or 5 days, the dose being then gradually diminished. The serum when given in carefully graduated doses, with proper precautions and in suitable cases, does no harm. Experience tends to show that the serum does produce a specific antitoxic effect.—*L.* '04, i. 859, 979; *B.M.J.* '04, i. 749, 857.

The treatment has so far proved rather disappointing (*L.* '04, ii. 1827), Marmorek's serum proving no more successful in active and progressive cases than other sera. The method of administration recommended in the *Edinburgh Medical Journal*, 1905, 213, is 3 c.c. injected on the first day, 4 c.c. on the second, 5 c.c. on the third day, no injections for the next three days, 5 c.c. on the seventh, 6 c.c. on the eighth, 7 c.c. on the ninth, and 8 c.c. on the tenth day. This completes the first series, and an interval of eight to ten days is allowed. Then 8 c.c., and in another series of eight injections the amount is raised to 20 c.c. Another interval, and then a further series of injections similar to the latter.

An interesting and instructive lecture on Antitoxins was delivered by Professor R. Tanner Hewlett at an evening meeting of the Pharmaceutical Society, and is duly reported in the *P.J.* '04, ii. 888; and *C.D.* '04, ii. 975.

An interesting *résumé* of the tuberculins and anti-tuberculous sera is given (*L.* '05, i. 923), the conclusion being that, judging from evidence, the use of tuberculins materially improves the results of treatment, and it would seem quite justifiable to supplement sanatorium methods with this specific one.

The method now recommended by Marmorek is the injection of 5 c.c. every other day for 3 weeks, followed by a clear 3 weeks' interval, after which the injections are repeated as before. The site of injection is preferably the abdominal walls or thighs, and should be varied as much as possible.

(1) The beneficial effects of the serum are most marked in the 'surgical' forms of the disease.

(2) No objectionable features whatsoever follow the injections.

(3) The pyrexia is diminished, though the fall in temperature is sometimes preceded by an initial rise.

(4) Pain in the 'surgical' forms is almost invariably alleviated.

(5) The amount of sputum in pulmonary tuberculosis is rapidly diminished.

(6) The general health rapidly improves and the patient gains in weight. —*L.* '05, ii. 760.

Cases on record (*L.* '05, ii. 603) which would seem to show that it undoubtedly exerts a neutralising effect on the tuberculosis toxin. In all cases in which the serum may be tried it is advisable not to push it unduly, and sufficient intervals should be allowed between the injections.

A valuable paper (*L.* '05, i. 928), by H. Batty Shaw, on the treatment of tuberculosis of the lungs by means of tuberculin and other bacterial derivatives. A history of the different tuberculins is given and their respective doses. Dr. Marmorek's serum is again referred to, and a review of the work of various experimenters is recorded. The general conclusion seems to be that, judging from the evidence, it would seem that the use of the tuberculins materially improves the results of treatment. Tuberculin treatment is of little use alone, but may be justifiable to supplement the ordinary treatment by sanatorium methods.

Many anti-tuberculous serums have been produced and others have attracted some attention. The results so far achieved have been inconclusive and, for the most part, disappointing.—*B.M.J.* '05, i. 1393.

SERUM FOR HAY FEVER.—Dunbar, by injecting horses with the toxin extracted from the pollen of various *Graminaceæ*, has obtained an anti-serum which is stated entirely to allay the troublesome symptoms of hay fever. The fluid serum is applied frequently to the eyes, a solid powder to the nose. The remedy is sold under the name of 'Pollantin.'

A lengthy paper appears in the *American Journal of Pharmacy*, 1905, 335, giving a *résumé* of this suggested remedy for hay fever. The substance is prepared in powder and in liquid form. The method of using is as follows:—

(1) Pour about a third of the contents of the serum-phial into the accompanying empty glass-phial, provided with a dropping pipette. The phial with dropper is

sent out in a small wooden case, and should be carried in the pocket as nearly as possible in the upright position.

(2) The method to employ in using liquid Pollantin is as follows: (*a*) For the eye. Bring, by means of the pipette, one drop to the outer angle of the eye, and, drawing down the lower lid with the finger, allow the drop to come into contact with the mucous membrane. A pleasantly cool sensation felt in the eye shows that the instillation has been properly carried out.

(*b*) For the nose. With the head bent somewhat backwards, insert the point of the pipette about ½ inch into each nostril, and express one or two drops of Pollantin into each. Care must be taken to keep the pipette squeezed so long as it is within the nose, otherwise the Pollantin will be drawn back into the pipette again. After Pollantin has been introduced into one nostril the other must be kept closed while the serum is snuffed up from the one treated, tapping the while on the outside of that nostril with the finger.

(3) The pipette, together with the india-rubber head, should be thoroughly cleansed at least once daily, and kept for one minute in boiling Water.

The powder is obtained (*A.J.P.* '05, 335) by completely drying the serum *in vacuo* at 45° C. (113° F.) and mixing it with sterilised Milk Sugar. It forms a yellowish and almost colourless powder. This should be snuffed into the nostrils or blown in with an insufflator, and can be dusted upon the conjunctiva with a camel's-hair brush.

The method of using the powder:—(1) A portion of the pulverised Pollantin as large as a lentil is dropped into the little scoop attached to the stopper of the bottle. The scoop is then held under one of the nostrils, the other nostril being compressed and occluded by the finger. The powder is then snuffed into the open nostril, the snuffing being repeated several times, during which the ala of the nostril is lightly tapped with the finger to distribute the powder over as much of the mucous membrane as possible. (2) If the powder is also to be used for the eyes, the accompanying camel's-hair brush is lightly dipped into it, the brush being then gently applied to the inner surface of the attached lower lid, or a small quantity of the powder may be shaken upon it from the brush. With each new bottle of the powder a new brush should also be brought into use.

Distressing symptoms following the use of 'Pollantin'; giddiness, tinnitus, vertigo and vomiting.—*L.* '05, ii. 130.

Semon, *B.M.J.* '03, i. 713; '04, i. 1168.

CANCER SERUM.—Various sera have been prepared for malignant growths. A recent one is that of Schmidt, but reports of its use are not encouraging.—*L.* '03, ii. 1374; *B.M.J.* '04, i. 299.

Doyen has reported the discovery of a micrococcus (*M. neoformans*) in cancerous tumours, and with the organism has prepared an anti-serum. The results of the inquiry at the Pasteur Institute and elsewhere are to establish that the *M. neoformans* does sometimes exist in cancerous tumours. Dudgeon finds that it is almost identical with *M. pyogenes albus* (*Jour. Hyg.* vii. '07, 13). As regards the serum, the tumours have diminished in size; but as to whether the serum can prevent recurrence, requires some years to answer.—*B.M.J.* '04, ii. 1712; *L.* '04, ii. 1799.

It is stated (*B.M.J.* '05, ii. 211) that during the five months in which all the cases which M. Doyen has wished to show have been examined, no single case of amelioration has been seen. Records of a further series of cases treated with the serum also appear in *L.* '06, i. 955, 1188, but in no case was any benefit seen.

NORMAL SERUM FOR ALIMENTATION.—Normal horse serum, heated to 60° C. (140° F.) for half an hour, may be used (*a*) to replace for a short time, or (*b*) to supplement, gastric or rectal feeding in cases of vomiting. obstruction, etc. For (*a*) children, 30 to 50 c.c., adults 100 to 150 c.c., for (*b*) 20 to 40 c.c. should be given subcutaneously daily.

Many other anti-sera have been prepared, but are of doubtful value and are not on the market (*e.g.*, cholera, dysentery, hydrophobia, leprosy, scarlatina, syphilis, whooping-cough, etc.).

Serum injections, *e.g.*, horse serum and diphtheria antitoxin, sometimes produce good effects in many diseases, *e.g.*, arthritis, gonorrhœa arthritis, asthma, broncho-pneumonia.

TUBERCULIN PREPARATIONS.

A.—**KOCH'S ORIGINAL TUBERCULIN.**—Prepared by boiling, concentrating, and filtering three-months-old Glycerin broth cultures of the tubercle bacillus.

An amber-coloured, syrupy fluid, with a characteristic odour. Gives the reactions for Glycerin and for albumoses.

The maximum initial dose should not exceed 0·001 c.c. and is administered by subcutaneous injection. The injection is followed in tubercular subjects by a rise of temperature of 2° to 5° F., and constitutional disturbance more or less severe. The dose must not be repeated until the reaction produced by the preceding one has completely passed off. The same dose is administered until it is followed by only a slight reaction; a larger amount may then be given, increasing by 0·001 c.c. until 0·005 is reached, then by 0·002 c.c. and so on.—Watson Cheyne, *Med. Chirurg. Trans.* 1891.

Goetsch considers that it is undesirable to obtain a reaction, and therefore commences with very small doses, 0·00001 to 0·0001 gramme; if even the former produces reaction, treatment is commenced with the *new* tuberculin 0·001 increasing to 0·1 milligramme. When this is reached treatment is continued with the old tuberculin, commencing with 0·0001 to 0·001 gramme.

For diagnostic purposes the initial dose should not exceed 0·005 c.c., which, if no reaction is produced, may be followed by 0·01 c.c. and 0·02 c.c. Tuberculin for diagnostic purposes has been applied to the skin after scarification (Von Pirquet's cutaneous reaction). Precipitated with Alcohol and the precipitate dissolved forms the solution used in Calmette's ophthalmo-reaction.

(For the diagnosis of tuberculosis in cattle the dose is 0·1 c.c. to 0·2 c.c.)

For the commencement of treatment a 1 p.c. solution is a convenient dilution, later on a 10 p.c. solution. The dilutions should be made with a ½ p.c. aqueous solution of Carbolic Acid, and only so much prepared as can be used in a few days. Now almost discarded for treatment, new tuberculin, TR, being used at present.

Tuberculinum Kochi is included in the *Ph. Ger.* It is described as a clear, light brown fluid, possessing a pleasant aromatic odour. It is readily miscible with Water. It contains in addition to the active constituents about 40 parts of Glycerin in 100 parts, as well as the constituents of the bouillon, but no antiseptic.

It is put up in flasks bearing an official leaden seal, and only the undiluted preparation is allowed to be held in stock. The dilutions recommended by the physician are directed in all cases to be freshly prepared, and sterilised Distilled Water or, still better, a 0·5 p.c. Carbolic Solution to be used in the preparation thereof. It must be kept in a cool place and protected from the light.

The tuberculins possess distinct value as a specific means of treatment. An interesting and encouraging account of the results which have followed the use of the original tuberculin of Koch was given (*B.M.J.* '05, i. 1393) by Professor McCall Anderson in an address at the annual meeting of the Dermatological Society of Great Britain and Ireland. The treatment extends over a period of six or more months. Beginning with an initial dose of from a ¼ to a ½ c.c. of a 1 in 1000 solution, the amount is gradually increased, according to the constitutional reaction obtained, up to as much as 1 c.c. of pure tuberculin. The injections are repeated every third or fourth day. Old tuberculin is still a valuable remedy, capable of producing satisfactory and even brilliant results.

Old tuberculin is not trustworthy in intra-ocular tuberculosis, and frequently did much harm. Useful as a means of diagnosis in intra-ocular tuberculosis, but useless in treatment.—*B.M.J.* '05, ii. 432.

Not necessary to employ tuberculin in gradually increased doses when using it for diagnostic purposes. Procedure consisted in administering the minimal dose of $\frac{2}{10}$ milligramme of Koch's old tuberculin in adults and $\frac{1}{10}$ milligramme in children, repeating the injection if necessary after an interval of 3 or 4 days.—*L.* '05, ii. 1203.

B.—**KOCH'S NEW TUBERCULIN.**—There are three varieties, termed respectively A., O., and R. Tuberculin R. or T.R. is the only one of therapeutic value.

It is prepared by triturating and emulsifying virulent tubercle bacilli with Distilled Water and centrifugalising. The fluid contains 2 milligrammes of solid matter per c.c. (not 10 milligrammes as formerly stated, *B.M.J.* '08, i. 463).

The fluid is administered by subcutaneous injection after diluting with sterile 20 p.c. Glycerin Solution. The preliminary doses should correspond to not more than $\frac{1}{500}$ of a milligramme of solid matter, *i.e.*, 0·5 c.c. of a dilution of 1 : 500. The doses now recommended are usually $\frac{1}{10000}$ to $\frac{1}{2000}$ milligramme administered every 10 to 14 days and controlled by opsonic determinations.

The impossibility of limiting the reactive energy of tuberculin to the skin prevents, in many cases, the utilisation of specific properties in the treatment of lupus vulgaris.—*B.M.J.* '05, i. 689.

The results gained by injections of Tuberculin T.R. are at least as good as those by any other method. It is not assumed that in Tuberculin T.R. a perfect remedy for tuberculosis of the urinary system exists, but for vesical tuberculosis it seems the best remedy at our disposal.—*L.* '05, ii. 1769; *B.M.J.* '05, ii. 1587.

Tuberculin R given in doses of about $\frac{1}{1000}$ milligramme at intervals determined by estimations of the opsonic power of the blood is a most valuable weapon in the fight against pulmonary tuberculosis.—*B.M.J.* '06, ii. 18.

Latham has adduced clinical and bacteriological evidence that Tuberculin R and bacterial vaccines produce their therapeutic effects when administered by the mouth.—*Proc. Roy. Soc. Med.* i. '08, Med. Sec. 195.

References.—*L.* '97, ii. 568, 600, 704, 1488; '98 ii. 194; *B.M.J.* '97, ii, 207; '98, i. 357; '98, ii. 77; *B.M.J.E.* '97, ii. 19, 27, 31, 55, 103; '98, i. 47, 55; *T.G.* '97, 850; '98, 400; *Pr.* lix. 399. Oxy Tuberculin.—*L.* '98, i. 179; *B.M.J.E.* '98, ii. 27.

OPSONINS.

Great interest has been aroused by the discovery of the significance attached to the opsonic power of the blood and the value of estimations of the opsonic index in the diagnosis and treatment of tuberculosis and other infections. The term 'opsonin' was invented by Wright and is derived from a classical word which means 'to cater or prepare victuals for,' and it apparently prepares the bacteria for ingestion by the phagocytes. Opsonins are described (*L.* '05, ii. 1917; *B.M.J.* '05, ii. 342) as substances contained in the serum or plasma of blood which possess the power of so modifying various kinds of bacteria as to render them an easier prey to the attacks of leucocytes.

This opsonic power is found in the blood of both healthy and diseased persons, but differs in degree, an essential difference being that whereas the degree is held to be approximately the same in normal healthy persons, wide variations are found amongst those who are diseased. The process of determining the opsonic index of the blood in tuberculosis is briefly outlined (*B.M.J.* '05, ii. 172) as follows:—Equal quantities of the patient's serum, an emulsion of tubercle bacilli (or other organisms), and leucocytes (washed in a solution of ½ p.c. Sodium Citrate in normal salt), are taken in a capillary pipette and incubated together for 15 minutes, after which films are made of the mixture and stained in a modified way for tubercle bacilli, etc.; the number of tubercle bacilli (or other organisms) ingested by 50 polynuclear white corpuscles is counted, and the figure thus obtained is compared with a standard similarly obtained, but using the serum of a *healthy* person. The former figure divided by the latter gives the 'opsonic index.' A series of experiments on the 'opsonin' treatment of tuberculous patients were undertaken at the London Hospital Medical College, and the results are recorded in the *L.* '05, ii. 1603.

An address on the opsonic theory and its practical application to medicine and surgery is reported in the *B.M.J.* '06, ii. 16, and gives a very lucid and up-to-date review of the present knowledge of this subject. (*See* also *Practitioner*, May 1908, Wright and others.)

VACCINES.

Vaccines are used either for prevention or prophylaxis, or for the treatment of chronic or sub-acute infections. For the latter, cultures of the organism corresponding to, and preferably isolated from, the infection, are sterilised by heat and standardised as to the number of organisms they contain in a given volume, from which the dose is calculated. For tuberculous infection Tuberculin R is used (*see* above).

GLYCERINATED VACCINE LYMPH is prepared by mixing calf lymph with 50 p.c. of Glycerin and storing for three months; this destroys all extraneous organisms. A preparation in which the extraneous organisms are killed with Chloroform is also prepared (Green's method). (Prophylactic.)

LEPROLIN.—A toxin of the cultivation of the *Bacillus lepræ*. It is stated (*B.M.J.* '05, i. 699) to have given good results in the treatment of leprosy.

By incubating leprous tissue in salt solution Deycke obtains a growth of an acid-fast streptothrix. A fatty substance extracted from this (termed Nastin) used for the treatment of leprosy.—*B.M.J.* '08, i. 802.

STAPHYLOCOCCIC VACCINE is prepared from cultures of the *S. pyogenes*, *aureus* and *albus* (dose 100-1000 millions). Valuable in chronic staphylococcic infections, *e.g.*, acne, furunculosis, sycosis, etc.—*B.M.J.* '04, i. 1075.

CHOLERA VACCINE is prepared from virulent cultures of the cholera spirillum. Dose, 1 c.c. (Wright and Bruce, *B.M.J.* '93, i. 227). (Prophylactic.)

TYPHOID VACCINE is prepared from virulent cultures of the *Bacillus typhosus* (Wright and Semple, *B.M.J.* '97, 256; Wright and Leishman, *ib.* '00, i. 122). (Prophylactic.)

PLAGUE VACCINE is prepared from cultures of the *Bacillus pestis* (*B.M.J.* '97, i. 1057 and 1461). (Prophylactic.)

Streptococcic (dose, 20–60 millions), Pneumococcic (dose, 10–50 millions), Gonococcic (dose, 100–500 millions), Malta fever, *Bacillus coli* (dose, 5–15 millions), and other vaccines have been used with success in the corresponding chronic or sub-acute infections. Vaccine treatment should be controlled by opsonic determinations.

ANTI-RABIC INOCULATION. The Pasteur system of inoculation as practised for bites of rabid animals. Emulsions of spinal cord of rabbits dried for periods varying from 14 to 3 days and injected subcutaneously. The treatment must be carried out at an Institute (*e.g.*, Pasteur Institute, Rue Dutot, Paris; Pasteur Institute, Lille). (Useless for treatment of disease when declared.)

Some of the anti-sera (diphtheria, tetanus, plague, and streptococcus) may be employed as prophylactics, but their protective power is transient (three weeks), whereas the vaccines protect for at least many months.

COLEY'S FLUID.

A fluid prepared by cultivating the streptococcus of erysipelas and the *Bacillus prodigiosus* in broth, and heating to 58° C. (136·4° F.) for one hour.

It has been used in the treatment of malignant growths, especially sarcomata. The dose to commence with is ½ to 1 minim, administered by injection in the neighbourhood of the tumour. The dose is gradually increased, the guide being the amount of reaction produced.

MALLEIN.

Prepared by boiling and concentrating broth cultures of the glanders bacillus. Employed for the diagnosis of glanders in animals. The requisite dose is injected subcutaneously in the neck. In a glandered animal a large swelling forms at the seat of inoculation, any local lesion becomes enlarged, and the temperature rises at least 2·5° F. above the normal. It is of no therapeutic value.

DE BACKER'S FLUID.

Pure cultures of yeast stored under pressure in syphon-like vessels provided with hollow needles by means of which the dose is injected.

Has been used in the treatment of tuberculosis and cancer.—*B.M.J.* '97, ii. 802.

CHEMICALS, REAGENTS, ETC.,

USED IN QUALITATIVE TESTING.

In the undermentioned list of substances and solutions used in chemical analysis, the word 'parts,' where it relates to preparations of the German Pharmacopœia, is to be understood to mean 'parts by weight.'

ACIDUM ACETICUM. ACETIC ACID.

B.P.
U.S.P. The acids official in the respective Pharmacopœias.

P.G.—The *P.G.* Acidum Aceticum Dilutum more closely resembles Acetic Acid *B.P.* and *U.S.P.* *See* Acidum Aceticum, p. 10.

ACIDUM ACETICUM GLACIALE.

B.P. The Glacial Acetic Acid official in the respective Pharmacopœias.
U.S.P. *See* Acidum Aceticum Glaciale, p. 12.

P.G.—Acidum Aceticum *P.G.* is practically Glacial.

ALBUMEN.

B.P.—A thin glairy liquid obtained from the egg of *Gallus Bankiva* var. *domesticus*, from which the shell and yellow yolk have been separated.

U.S.P.
P.G. Not included.

Coagulated White of Egg is employed by the *B.P.*, *U.S.P.* and *P.G.* as a test for the activity of Pepsin.

ALBUMEN SOLUTION.

B.P.—Albumen, 1 c.c.; Water, 4 c.c. The solution is recommended to be freshly prepared, and either the above quantity of Water may be added or a sufficiency to adjust the solution to meet the requirements of individual tests. The solution may be strained through moist cotton-wool or tow.

U.S.P.—The liquid portion of a fresh hen's egg, freed from the yolk, mixed with 100 c.c. of Water and filtered. It is recommended that the solution be prepared fresh for use when required.

P.G.—Not included.

ALCOHOL, ABSOLUTE.

B.P.
P.G. The Absolute Alcohol official in the respective Pharmacopœias.
U.S.P.

ALCOHOL, DILUTED.

B.P.—The *B.P.* employs 90 p.c. and 70 p.c. Alcohols; the *U.S.P.* uses four strengths, viz., the Alcohol of the Pharmacopœia (94·9 p.c.), 90 p.c., 80 p.c., and 70 p.c.; and the *P.G.* uses the official 'Spiritus' containing from 90 to 91·2 p.c. of Ethylic Alcohol. All by volume.

ALUM.

B.P.—A colourless transparent crystalline salt represented by the chemical formula $Al_2(SO_4)_3$, K_2SO_4, $24H_2O$, or $Al_2(SO_4)_3$, $(NH_4)_2SO_4$, $24H_2O$.

P.G.
U.S.P. } Not included.

AMMONIA SOLUTION.

B.P.—The official 'Liquor Ammoniæ.'
P.G.—The official 'Liquor Ammonii Caustici.'
U.S.P.—The official 'Aqua Ammoniæ.'
They each contain 10 p.c. by weight of Ammonia. For strong solution of Ammonia the *B.P.* directs the use of the official 'Liquor Ammoniæ Fortis.'

AMMONIUM ACETATE SOLUTION.

B.P.—The official 'Liquor Ammonii Acetatis.'

P.G.
U.S.P. } Not included.

AMMONIUM CARBONATE SOLUTION.

B.P.—A filtered solution of 5 grammes of Ammonium Carbonate, 7·5 c.c. of Ammonia Solution, and Distilled Water *q.s.* to yield 100 c.c.

P.G.—Ammonium Carbonate 1 part, dissolved in a mixture of Water 3 parts and Solution of Ammonia 1 part.

U.S.P.—Ammonii Carbonas, *U.S.P.* 20 grammes dissolved in a mixture of Ammonia Water 20 c.c. and Water 70 c.c.; adding *q.s.* of Water to measure 100 c.c.

AMMONIUM CHLORIDE SOLUTION.

B.P.
U.S.P. } A filtered solution of 10 grammes of Ammonium Chloride in Distilled Water *q.s.* to measure 100 c.c.
P.G.—Dissolve 1 part of Ammonium Chloride in 9 parts of Water.

AMMONIUM CHLORIDE, NESSLER'S SOLUTION OF.

B.P.—A solution of 0·315 gramme of Ammonium Chloride in recently boiled and Ammonia free Distilled Water *q.s.* to measure 100 c.c.

AMMONIUM CITRATE SOLUTION.

B.P.—The official 'Liquor Ammonii Citratis.'

P.G.
U.S.P. } Not included.

AMMONIUM HYDROSULPHIDE. *See* AMMONIUM SULPHIDE.

AMMONIUM MOLYBDATE.

B.P.—A white or almost white crystalline solid, represented by the chemical formula $(NH_4)_2MoO_4$.

U.S.P.
P.G. } Not included.

AMMONIUM MOLYBDATE SOLUTION.

B.P.—Ammonium Molybdate, 10 grammes; Water, *q.s.* to produce 100 c.c.; filter.

U.S.P.—Ammonium Molybdate $(NH_4)_6Mo_7O_{24}4H_2O$, 15 grammes; Ammonia Solution, if necessary, *q.s.* to effect solution; Water, 100 c.c. This solution is gradually poured into an equal volume of Nitric Acid [sp. gr. 1·403 at 25° C. (77° F.)]. The solution is submitted to a gentle heat for about 2 hours, and decanted from any yellow deposit which may form. An alternative method is to mix gradually and with repeated shaking a solution obtained by dissolving Molybdic Acid (H_2MoO_4), 10 grammes; Ammonia Solution, 42 c.c. with a solution obtained by mixing 63 c.c. of Nitric Acid, of the above sp. gr. with an equal volume of Water. Heat gently for two hours. Any yellow sediment separating out after the solution has been made some days may be separated by decanting the liquid in the same manner as above. It is recommended that the reagent be kept in the dark, and the clear solution decanted from any sediment which may separate out from time to time.

P.G.—Not included.

AMMONIUM OXALATE.

B.P.—The colourless crystalline salt represented by the chemical formula $(NH_4)_2 C_2O_4, H_2O$.

P.G.
U.S.P. } Not included.

AMMONIUM OXALATE SOLUTION.

B.P.—A filtered solution of 2·5 grammes of Ammonium Oxalate in Distilled Water *q.s.* to measure 100 c.c.

P.G.—A solution of 1 part of Ammonium Oxalate in 24 parts of Water.

U.S.P.—The solution of 4 grammes of pure crystallised Ammonium Oxalate $[(NH_4)_2 C_2O_4, H_2O]$ in Water *q.s.* to measure 100 c.c. An alternative method is to dissolve 4 grammes of pure Oxalic Acid in 100 c.c. of Water, add 15 c.c. of Ammonia Water, boil to expel excess of Ammonia, and dilute with Water to 113 c.c. The *U.S.P.* requires that the residue obtained on evaporating a portion of the solution should, when ignited, be completely volatilised. The absence of Chlorides and Sulphates should be proved by the precipitate produced by Silver Nitrate T.S. or by Barium Chloride T.S. being completely soluble on the addition of Nitric Acid.

AMMONIUM SULPHATE.

B.P.
P.G. } Not included.

U.S.P.—The salt represented by the chemical formula $(NH_4)_2 SO_4$ and may be prepared by neutralising a mixture of equal volumes of pure Sulphuric Acid and Water with Ammonia Water, then evaporating the solution and crystallising. The alkalinity of the liquid should be maintained during the evaporation, if necessary, by the addition of more Ammonia, ascertained by testing from time to time with Litmus paper. Three grammes of the salt should leave no appreciable residue upon ignition. An aqueous solution of the salt (1–10) should not respond to the time-limit test for heavy metals, nor should it become turbid with Nitric Acid and Silver Nitrate T.S. A similar solution of the salt should not be coloured red by 2 drops of Hydrochloric Acid and 1 drop of Ferric Chloride T.S. (absence of Sulphocyanate).

AMMONIUM SULPHIDE SOLUTION.

B.P.—The *B.P.* uses a solution of Ammonium Hydrosulphide prepared by passing washed Hydrogen Sulphide through 60 c.c. of Solution of Ammonia until saturated, then adding a further 40 c.c. of Solution of Ammonia. It recommends that the solution be prepared when required.

P.G.—Not included.

U.S.P.—The solution is prepared by saturating 3 parts of Ammonia Water with Hydrogen Sulphide, and then converting the greater portion of the Ammonium Hydrogen Sulphide formed into Ammonium Sulphide by the addition of 2 parts of Solution of Ammonia. It should be kept in small dark amber-coloured bottles in a cool, dark place, and when a notable deposit of Sulphur has made its appearance the solution should be rejected. It should be a perfectly clear and colourless solution, leaving no residue on evaporation, nor should any turbidity be produced in it by Magnesium Sulphate T.S. or by Calcium Chloride T.S.

If Ammonium Polysulphide T.S. be required it may be prepared by dissolving a small quantity of pure Sulphur in Ammonium Sulphide T.S.

AMMONIUM THIOCYANATE.

B.P.—The crystalline salt represented by the chemical formula NH_4SCN.

P.G.
U.S.P. } Not included.

AMMONIUM THIOCYANATE SOLUTION.

B.P.—A filtered solution of 2·5 grammes of Ammonium Thiocyanate in Distilled Water *q.s.* to measure 100 c.c.

P.G.
U.S.P.} Not included.

AMYL ALCOHOL.

B.P.—A clear, colourless liquid, sp. gr. about 0·812, which is obtained by fractionating Fusel Oil, after the impurities soluble in a saturated Sodium Chloride Solution have been removed by shaking with that menstruum. The fraction distilling between 125° and 142·8° C. (257° and 289° F.) may be reserved for use. It contains principally Iso-amyl Alcohol. The boiling point of Iso-amyl Alcohol, it may here be noted, is between 128° to 132° C. (262·4° to 269·6° F.).

U.S.P.—A colourless oily liquid, boiling at 131° C. (267·8° F.). Soluble 1 in 40 of Water at 25° C. (77° F.), miscible with Alcohol (94·9 p.c.), Ether (sp. gr. 0·716 at 25° C. (77° F.)), Chloroform, Carbon Di-sulphide, Petroleum Benzin, Benzene, fixed and volatile oils.

P.G. A colourless completely volatile liquid (sp. gr. 0·814). Boiling point 129° to 131° C. (264·2° to 267·8° F.).

AURIC CHLORIDE SOLUTION.

B.P.—A solution containing approximately 4·28 p.c. Chlorauric Acid, equivalent to 3 p.c. w/v of Auric Trichloride prepared by dissolving 1 gramme of pure commercial Leaf Gold in a mixture of 1·5 c.c. of Nitric Acid and 6 c.c. of Hydrochloric Acid, adding a further 1 c.c. of Hydrochloric Acid when solution is effected; evaporating to dryness at a temperature of 100° C. (212° F.) until free from acid vapours, and dissolving the residual Chloride in 50 c.c. of Water.

P.G.—Not included.

U.S.P.—Convert commercial Gold Chloride [consisting chiefly of Chlorauric Acid ($HAuCl_4,4H_2O$)] into neutral Auric Chloride by fusing it at a temperature not exceeding 150° C. (302° F.), moistening the residue with enough hot Water to produce a syrupy liquid. The clear liquid poured off from the precipitate and mixed with 20 volumes of Water gives the test-solution. An alternative method is to dissolve 1 gramme of dry Auric Chloride in 30 c.c. of Water.

BARIUM CARBONATE.

B.P.
P.G.} Not included.

U.S.P.—The purified salt represented by the chemical formula $BaCO_3$, prepared by precipitating a solution of 12 parts of purified crystallised Barium Chloride in boiling Water 30 parts, with Ammonium Carbonate, 5 parts, followed by Ammonia Water, 5 parts. The precipitate is then thoroughly washed and dried.

BARIUM CHLORIDE.

B.P.—The official salt is in colourless crystals and contains 2 molecules of Water of crystallisation, and is represented by the formula $BaCl_2\ 2H_2O$, eq. 242·54. It is officially required to contain not more than traces of Iron, as indicated by its aqueous solution yielding no precipitate with Ammonium Hydrosulphide Solution; and to be free from alkali and alkali earthy metals as indicated by its failure to leave a residue when the filtrate, after the complete removal of Barium by diluted Sulphuric Acid, is evaporated to dryness in a platinum dish. It will be noted that the *U.S.P.*, which gives a similar test, evaporates to dryness and heats on a platinum foil. Unless the amount of diluted Sulphuric Acid corresponds exactly to that necessary to precipitate the whole of the Barium, a slight residue of the concentrated acid will remain. The *U.S.P.* directions are therefore somewhat more explicit. The *B.P.* permits the use of either Barium Nitrate, $Ba(NO_3)_2$, eq. 259·56, or Barium Acetate, $Ba(C_2H_3O_2)_2$, eq. 253·56, provided they manifest a similar degree of freedom from these impurities.

U.S.P.—A salt of similar composition to that of the *B.P.*, but the aqueous solution is required to be perfectly neutral, not to respond to the time-limit test for heavy metals, namely, Antimony, Arsenic, Cadmium, Copper, Iron, Lead and Zinc, to be free from traces of Strontium, as indicated by the colour imparted to a non-luminous flame by diluted Alcohol which has been allowed to remain in contact with the salt for some hours; the colour which it is required should be imparted being that of a pure yellowish-green free from red, and it is required to be free from other fixed bases as determined by completely removing the Barium by diluted Sulphuric Acid, evaporating the filtrate to dryness and heating on platinum foil.

P.G.—The salt is official in the text of the *P.G.* *See* Barium Chloride. Not in the list of reagents.

BARIUM CHLORIDE SOLUTION.

B.P.—A 10 p.c. w/v clear filtered solution of the official salt.

U.S.P.—A 10 p.c. w/v solution of the official salt.

P.G.—A 5 p.c. w/w solution of Barium Nitrate in place of a solution of the Chloride.

BARIUM HYDROXIDE.

B.P.—A crystalline salt represented by the chemical formula $Ba(OH)_2,8H_2O$, eq. 313·20, prepared by the purification by recrystallisation of the precipitate obtained by the interaction of concentrated Barium Chloride and Sodium Hydroxide Solutions. It is required to be free from heavy metals, *e.g.*, Arsenic, Copper, Iron, Lead and Zinc, as ascertained by its aqueous solution yielding no precipitate with Ammonium Hydrosulphide Solution, and to be free from metals of the alkalis and alkali earths as ascertained by the evaporation to dryness of the filtrate after the complete removal of the Barium as Barium Sulphate by means of a dilute Sulphuric Acid; only a very slight residue should remain.

P.G. }
U.S.P. } Not included.

BARIUM HYDROXIDE SOLUTION.

B.P.—A filtered solution of 5 grammes of Barium Hydroxide in recently boiled Distilled Water *q.s.* to measure 100 c.c.

P.G.—A solution of crystalline Barium Hydroxide, 1 part in 19 parts of Water.

U.S.P.—A saturated aqueous solution of the salt $Ba(OH_2) + 8H_2O$, to be prepared when required for use.

BARIUM NITRATE SOLUTION.

B.P.—*See* Barium Chloride.

P.G.—A 5 p.c. w/w solution of Barium Nitrate.

U.S.P.—A 10 p.c. w/v solution of the pure salt, $Ba(NO_3)_2$. Barium Nitrate should answer the tests described under Barium Chloride *U.S.P.*, but its aqueous solution acidulated with Nitric Acid should not be rendered turbid by Silver Nitrate T.S., indicating the absence of Chlorides.

BENZIN OR PETROLEUM BENZIN.

B.P.—Not included.

P.G.—The official 'Benzinum Petrolei' of the Pharmacopœia. Sp. gr. 0·640 to 0·670. Boiling point between 50° and 75° C. (122° and 167° F.).

U.S.P.—The official 'Benzinum Purificatum' of the Pharmacopœia. Sp. gr. 0·638 to 0·660 at 25° C. (77° F.). Boiling point 45° to 60° C. (113° to 140° F.).

BENZOL.

B.P.—The official Benzol of the Pharmacopœia.

P.G.—A colourless liquid. Sp. gr. 0·880 to 0·890. Boiling point 80° to 82° C. (176° to 179·6° F.).

U.S.P.—Benzene or Benzole is a colourless, transparent liquid, represented by the chemical formula C_6H_6. Sp. gr. 0·871 at 25° C. (77° F.). It congeals at 5·2° C. (41·3° F.) and boils at 80·4° C. (176·7° F.). It is insoluble in Water, but soluble in 4 parts of Alcohol and in Ether.

Concentrated Sulphuric Acid when shaken with an equal volume of Benzene should not become coloured. 2 c.c. of Benzene, 0·5 c.c. of Sulphuric Acid and 1 drop of fuming Nitric Acid shaken together should not produce a green or blue tint.

BENZOLATED AMYL ALCOHOL.

B.P.—A mixture of Benzol and Amyl Alcohol, containing about a quarter of its volume of Amyl Alcohol, and prepared by mixing 30 parts of Benzol with 10 of Amyl Alcohol; any Water which separates out being removed by decantation. It is chiefly used as a solvent for the mixed alkaloids in the assay of Cinchona Bark and its galenical preparations.

P.G.
U.S.P. } Not included.

BISMUTH OXYNITRATE.

B.P.—The official salt of the Pharmacopœia.

P.G.
U.S.P. } Not included.

BORAX.

B.P.
P.G. } The official salt of the respective Pharmacopœias.
U.S.P.—Not included.

BORIC ACID, SOLUTION OF.

B.P.—A filtered 2·5 p.c. w/v solution of the official acid in Alcohol (90 p.c.).

P.G.
U.S.P. } Not included.

BROMINE.

B.P.—Commercial Bromine.
P.G.—The 'Bromum' of the Pharmacopœia.
U.S.P.—Not included.

BROMINE, SOLUTION OF.

B.P.—A 0·66 p.c. v/v solution of Bromine in Distilled Water. Should be kept protected from light.

P.G.—A saturated aqueous solution.

U.S.P.—A 1 p.c. v/v aqueous solution of the 'Bromum' of the Pharmacopœia.

CADMIUM IODIDE.

B.P.—The crystalline commercial salt represented by the chemical formula CdI_2.

P.G.
U.S.P. } Not included.

CADMIUM IODIDE, SOLUTION OF.

B.P.—A 5 p.c. w/v filtered aqueous solution of the above salt.

P.G.
U.S.P. } Not included.

CALCIUM CARBONATE.

B.P.—Commercial White Marble or Calc Spar.
P.G.—The salt should be free from Chlorides.
U.S.P.—Not included.

CALCIUM CHLORIDE SOLUTION.

B.P.—A filtered 10 p.c. w/v aqueous solution of the fused salt.
P.G.—A 10 p.c. w/w aqueous solution of the crystallised salt.
U.S.P.—A 10 p.c. w/v aqueous solution of the crystallised salt $CaCl_2 + 6H_2O$.

CALCIUM HYDROXIDE.

B.P.—The slaked Lime of the Pharmacopœia.
P.G.—Calcaria Hydrica.
U.S.P.—Not included.

CALCIUM HYDROXIDE SOLUTION.

B.P.
P.G. } The Lime Water official in the respective Pharmacopœias.
U.S.P.

CALCIUM SULPHATE.

B.P.—The pure native salt represented by the chemical formula $CaSO_4$, $2H_2O$.
P.G.
U.S.P. } Not included.

CALCIUM SULPHATE SOLUTION.

B.P.—A saturated filtered aqueous solution of Calcium Sulphate prepared by triturating 1·25 grammes of the salt with 10 c.c. of Distilled Water in a porcelain mortar and adding 90 c.c. of Water, filtering after allowing to stand for some time.

P.G.—A saturated aqueous solution of the salt.

U.S.P.—A saturated aqueous solution of native Gypsum, $CaSO_4$, $2H_2O$, obtained by shaking the powdered crystals of Gypsum in a bottle nearly full with Water at intervals during 12 hours, then decanting the clear saturated solution when required. The solubility at 25° C. (77 F.) is 1 in 378.

CARBON BISULPHIDE (DISULPHIDE).

B.P.
U.S.P. } The Carbon Disulphide official in the respective Pharmacopœias.

P.G.—A colourless, volatile, neutral liquid. Boiling point 46° C. (114·8° F.). Sp. gr. 1·272.

CHLORINATED SODA SOLUTION.

B.P.—The official Liquor Sodæ Chlorinatæ.
P.G.
U.S.P. } Not included.

CHLORINE SOLUTION.

B.P.—A freshly prepared, saturated solution of Chlorine in Water, obtained by saturating Water with the purified and washed gas obtained by the decomposition of Hydrochloric Acid and Manganese Dioxide. It possesses a gravity of 1·003, and contains about 0·5 p.c. of available Chlorine.

U.S.P.—The Liquor Chlori Co. of the Pharmacopœia. It contains about 0·4 p.c. of Chlorine and should be freshly prepared when required.

P.G.—The 'Aqua Chlorata' of the Pharmacopœia. A solution of Chlorine containing not less than 0·4 p.c. and not more than 0·5 p.c. w/w of Chlorine.

CHLOROFORM.

B.P.
P.G. } The Chloroform official in the respective Pharmacopœias.
U.S.P.

The *U.S.P.* requires that it should be strictly neutral to Litmus paper.

CHROMIC ACID SOLUTION.

B.P.—The Liquor Acidi Chromici of the Pharmacopœia.
P.G.—A 3 p.c. w/w aqueous solution of Chromic Acid prepared when required.
U.S.P.—Not included.

CITRIC ACID.

B.P.—The acid official in the Pharmacopœia.

P.G. *U.S.P.* } Not included.

COBALTOUS NITRATE SOLUTION.

B.P. *P.G.* } Not included.

U.S.P.—An approximately 10 p.c. w/v solution of Cobaltous Nitrate obtained by dissolving 1 gramme of the commercial Cobaltous Nitrate in 10 c.c. of Water.

Commercial crystalline Cobalt Nitrate $Co(NO_3)_2$, $6H_2O$, may be used in making the solution if, when dissolved in Water and the Cobalt precipitated by Ammonium Sulphide T.S., the filtrate leaves no residue after evaporating and igniting.

COLLODION.

B.P. *P.G.* } The Collodion official in the respective Pharmacopœias.

U.S.P.—Not included.

COPPER.

B.P. *U.S.P.* } The metal Cu in the form of wire, foil, or turnings.

P.G.—Not included.

COPPER OXYACETATE.

B.P.—Pure commercial Verdigris.

P.G. *U.S.P.* } Not included.

COPPER ACETATE SOLUTION.

B.P.—A filtered 10 p.c. w/v aqueous solution of Copper Oxyacetate prepared by digesting a weighed quantity of 10 grammes of finely-powdered Copper Oxyacetate in a mixture of 20 c.c. of Acetic Acid, and 10 c.c. of Water at a temperature of 100° C. (212° F.), evaporating to dryness, digesting the resulting residue in 80 c.c. of boiling Water, adding sufficient Water to produce a volume of 100 c.c.

COPPER SULPHATE.

B.P.—The salt represented by the chemical formula $CuSO_4$, $5H_2O$, official in the Pharmacopœia.

P.G. *U.S.P.* } Not included.

COPPER SULPHATE SOLUTION.

B.P. *U.S.P.* } A 10 p.c. w/v solution of Copper Sulphate in Water (filtered if necessary, *B.P.*)

The *U.S.P.* uses the salt, $CuSO_4$, $5H_2O$, official in the text.

P.G.—Not included.

DIPHENYLAMINE TEST-SOLUTION.

B.P. *P.G.* } Not included.

U.S.P.—A 0·2 p.c. w/v solution of Diphenylamine in diluted Sulphuric Acid. Diphenylamine, $(C_6H_5)_2NH$, is in greyish-white or colourless crystals, slightly soluble in Water, more soluble in acids. It has a peculiar, aromatic odour, and melts at 54° C. (129·2° F.). The T.S. should be colourless.

ETHER.

B.P.
P.G. } The Ether official in the respective Pharmacopœias.
U.S.P.

The *U.S.P.* requires that it should be strictly neutral to moistened Litmus paper.

FERRIC AMMONIUM SULPHATE SOLUTION.

B.P.—Not included.

P.G.—A solution of 1 part of Ferric Ammonium Sulphate in a mixture of Water 8 parts, and diluted Sulphuric Acid 1 part, to be prepared when required.

U.S.P.—A 10 p.c. w/v aqueous solution of Ferric Ammonium Sulphate $FeNH_4(SO_4)_2, 12H_2O$, *U.S.P.*

FERRIC CHLORIDE.

B.P.—The pure anhydrous commercial Ferric Chloride.

P.G.
U.S.P. } Not included.

FERRIC CHLORIDE SOLUTION.

B.P.—A 5 p.c. w/v aqueous solution of the above pure anhydrous Ferric Chloride. It should be filtered if necessary.

P.G.—Use the 'Liquor Ferri Sesquichlorati' of the Pharmacopœia diluted when necessary as directed.

U.S.P.—A 10 p.c. w/v solution of the Ferric Chloride of the Pharmacopœia in Distilled Water.

FERRIC SULPHATE SOLUTION.

B.P.—Use the 'Liquor Ferri Persulphatis' of the Pharmacopœia.

P.G.
U.S.P. } Not included.

FERROUS SULPHATE.

B.P.—The salt official in the Pharmacopœia represented by the chemical formula $FeSO_4, 7H_2O$.

P.G.
U.S.P. } Not included.

FERROUS SULPHATE SOLUTION.

B.P.—A freshly prepared, filtered 2 p.c. w/v solution of Ferrous Sulphate in Distilled Water.

P.G.—A solution of 1 part of Ferrous Sulphate in a mixture of 1 part of Water, and 1 part of diluted Sulphuric Acid to be prepared when required.

U.S.P.—The *U.S.P.* directs that a clear crystal of Ferrous Sulphate $FeSO_4, 7H_2O$ be dissolved in about 10 parts of Water which has been previously boiled to expel air. The solution should be freshly prepared immediately before use.

FERROUS SULPHIDE.

B.P.
P.G. } Not included.

U.S.P.—A heavy solid represented by the chemical formula FeS. It is in the form of black or brownish-black irregular masses, or fused into sticks, and is soluble in diluted Sulphuric Acid or diluted Hydrochloric Acid, with copious evolution of Hydrogen Sulphide.

GELATIN TEST-SOLUTION.

B.P.
P.G. } Not included.

U.S.P.—A freshly made solution of 1 gramme of the Gelatin official in the Pharmacopœia in 50 c.c. of Water. It is made with the aid of a gentle heat, and filtered if necessary.

GLYCERIN.

B.P.
P.G. The Glycerin official in the respective Pharmacopœias.
U.S.P.—Not included.

HYDROCHLORIC ACID.

B.P.
P.G. The Acidum Hydrochloricum of the respective Pharmacopœias.
U.S.P.

The *U.S.P.* requires that the acid for use as a reagent should conform to the following additional tests: The addition of 1 c.c. of Barium Chloride T.S. to 1 c.c. of the acid diluted with 9 c.c. of Water should cause no turbidity within 24 hours. A crystal of Diphenylamine dropped into the acid should not turn blue (absence of free Chlorine).

HYDROCHLORIC ACID, DILUTED.

B.P.—The diluted acid of the Pharmacopœia containing 10·58 p.c. of Hydrogen Chloride.

P.G.
U.S.P. Not included.

HYDROCHLORIC ACID, FUMING.

B.P.
U.S.P. Not included.

P.G.—A colourless fuming liquid answering the tests of purity for the Hydrochloric Acid of the Pharmacopœia. Sp. gr. 1·190.

HYDROCHLORIC ACID, GASEOUS.

B.P.—Hydrochloric Acid in the dry gaseous form, directed to be prepared from Sulphuric Acid and Sodium Chloride.

P.G.
U.S.P. Not included.

HYDROGEN PEROXIDE SOLUTION.

B.P.—The official Liquor of the Pharmacopœia.

P.G.
U.S.P. Not included.

HYDROGEN SULPHIDE.

B.P. The washed gas represented by the chemical formula H_2S obtained
U.S.P. by the action of Hydrochloric Acid on Ferrous Sulphide. The *B.P.* employs Hydrochloric Acid, the *U.S.P.* diluted Sulphuric Acid.

P.G.—Not included.

The *B.P.* states that the gas may be used after having been passed through two wash-bottles containing Water, and the *U.S.P.* requires that after generation the gas be treated as described under Hydrogen Sulphide Solution.

HYDROGEN SULPHIDE SOLUTION.

B.P.—An aqueous solution of Hydrogen Sulphide gas. It should have a strong odour of Hydrogen Sulphide and should give a copious black precipitate with Lead Subacetate T.S.

P.G.—A saturated aqueous solution of Hydrogen Sulphide.

U.S.P.—A saturated aqueous solution of Hydrogen Sulphide. It directs that 1000 c.c. of the solution be prepared by treating 20 grammes of Ferrous Sulphide with 20 c.c. of Sulphuric Acid (*U.S.P.*) mixed with 250 c.c. of Water. The generated gas is first passed through a drying tube containing granulated Calcium Chloride, then from this through a tube of about 8 mm. diameter and about 40 cm. in length, containing about 5 grammes of coarsely pulverised Iodine mixed with glass wool, and finally through a wash-bottle containing a little Potassium Iodide T.S. The purified gas is then passed through 1000 c.c. of Water contained in a bottle of 1500 c.c. capacity, shaking the bottle occasionally.

After absorption ceases the solution is transferred to small dark amber-coloured bottles, allowing a stream of the gas to pass through each before stoppering. The bottles should be filled nearly to the top and preserved in a cool and dark place. The solution should only be used if it retains a strong odour of the gas and yields a copious precipitate of Sulphur when it is added to an equal volume of Ferric Chloride T.S.

ISINGLASS.

B.P.—A shredded gelatinous substance prepared from the sounds or swimming bladders of different species of *Acipenser*, Linn. *See* also p. 655.

P.G.
U.S.P. } Not included.

ISINGLASS, SOLUTION OF.

B.P.—The freshly prepared, filtered, aqueous 2 p.c. w/v solution of Isinglass prepared by digesting the Isinglass in Water for half an hour at a water-bath temperature. The product is filtered through tow.

LEAD ACETATE.

B.P.—The salt official in the Pharmacopœia.

P.G.
U.S.P. } Not included.

LEAD ACETATE SOLUTION.

B.P.
U.S.P. } A 10 p.c. w/v solution of the salt in Distilled Water.

P.G.—A 10 p.c. w/w solution of the salt in Distilled Water.

The *B.P.* directs that recently boiled Distilled Water should be used and that the solution be filtered. The *U.S.P.* directs that only transparent crystals of the salt be used free from adhering Carbonate.

LEAD PEROXIDE.

B.P.—The pure commercial Lead Peroxide represented by the chemical formula PbO_2.

P.G.
U.S.P. } Not included.

LEAD SUBACETATE SOLUTION.

B.P.
P.G.
U.S.P. } The 'Liquor Plumbi Subacetatis Fortis' official in the respective Pharmacopœias.

This is the Basic Lead Acetate Test Solution of the *U.S.P.*

LIME, SOLUTION OF CHLORINATED.

B.P.
U.S.P. } Not included.

P.G.—Triturate 1 part of Chlorinated Lime with 9 parts of Water, and filter the solution. It should be prepared when required.

MAGNESIUM AMMONIO-SULPHATE SOLUTION. (MAGNESIA MIXTURE, *U.S.P.*)

B.P.
U.S.P. } Magnesium Sulphate, 10 grammes; Ammonium Chloride, 20 grammes; dissolve in 80 c.c. of Water and add 42 c.c. of Ammonia Solution (Aqua Ammoniæ, *U.S.P.*).

The *B.P.* directs that the mixture be allowed to stand for a few days in a well-stoppered bottle, then decanted and filtered. The *U.S.P.* states that if not perfectly clear the mixture should be filtered before using.

MAGNESIUM SULPHATE SOLUTION.

B.P.
U.S.P. } A 10 p.c. w/v (filtered *B.P.*) solution of the official salt in Distilled Water.

P.G.—A 10 p.c. w/w solution of the salt in Water.

MANGANESE PEROXIDE.

B.P.
P.G. } Powdered native Pyrolusite, MnO_2.

U.S.P.—Not included.

MERCURIC CHLORIDE SOLUTION.

B.P.
U.S.P. } A 5 p.c. w/v filtered aqueous solution of the official salt.

P.G.—A 5 p.c. w/w aqueous solution of the official salt.

MERCURIC NITRATE SOLUTION.

B.P.
P.G. } Not included.

U.S.P.—The 'Liquor Hydrargyri Nitratis' of the Pharmacopœia.

MERCUROUS NITRATE SOLUTION.

B.P.—A solution of Mercurous Nitrate obtained by dissolving 1 gramme of Mercury in a mixture of 0·5 c.c. of Water and 0·5 c.c. of Nitric Acid, the mixture being allowed to remain at rest for 24 hours in a cool dark place and the crystalline residue dissolved in 100 c.c. of Water.

U.S.P.—A solution of Mercurous Nitrate prepared by mixing 10 grammes of Mercury, 5 c.c. of pure Nitric Acid, and 5 c.c. of Distilled Water, and setting aside in a cool dark place. The crystals formed during 24 hours are, after draining, dissolved in 100 c.c. of Water. The solution should be preserved in a dark amber-coloured bottle into which a small quantity of Mercury has been introduced.

P.G.—Not included.

METHYL ALCOHOL.

B.P.
P.G. } Not included.

U.S.P.—Rectified, purified wood Alcohol CH_3OH. Sp. gr., about 0·812 at 25° C. (77° F.). It should be free from pyroligneous odour.

MICROCOSMIC SALT.

B.P.—The commercial salt represented by the chemical formula $NaNH_4HPO_4, 4H_2O$.

P.G.
U.S.P. } Not included.

NAPHTHYLAMINE ACETATE SOLUTION.

B.P.
P.G. } Not included.

U.S.P.—Boil 0·1 gramme of Alphanaphthylamine Acetate ($C_{10}H_7NH_2.HC_2H_3O_2$) in 20 c.c. of Distilled Water, filter through cotton, and mix the filtrate with 180 c.c. of diluted Acetic Acid (10 p.c. of absolute Acid). Only freshly Distilled Water should be employed in preparing this reagent, which must be kept in well-stoppered bottles protected from the light.

NITRIC ACID.

B.P.
P.G.
U.S.P. } The official Nitric Acid of the respective Pharmacopœias.

NITRIC ACID, CRUDE.

B.P.
U.S.P. } Not included.

P.G.—A clear, colourless or yellowish coloured liquid, fuming in the air, completely volatile on warming. Sp. gr. 1·380 to 1·400. It contains 61 p.c. of pure acid.

NITRIC ACID, DILUTED.

B.P.—The official diluted acid of the Pharmacopœia.

P.G.—Nitric Acid 1 part, Water 1 part; prepared when required.

U.S.P.—Not included.

NITRIC ACID, FUMING.

B.P.—Nitric Acid having a sp. gr. of 1·5.

P.G.—A clear reddish-brown liquid, completely volatile on warming. It evolves suffocating yellowish-red fumes. Sp. gr. 1·486 to 1·500. It contains 86 p.c. of pure acid.

U.S.P.—The commercial red fuming acid. Sp. gr. 1·437 at 25° C. (77° F.). It should be carefully kept in glass-stoppered bottles in a cool place.

OLIVE OIL.

B.P.—The Olive Oil of the Pharmacopœia.

P.G. *U.S.P.* } Not included.

OXALIC ACID.

B.P.—Not included.

P.G.—The air-dried acid. It should leave no residue when ignited on platinum foil.

U.S.P.—Pure Oxalic Acid represented by the chemical formula $H_2C_2O_4 + 2H_2O$; 10 grammes on ignition on platinum foil should leave no residue. It should be completely soluble in 12 parts of Water at 25° C. (77° F.). For the preparation of test and volumetric solutions, commercial Oxalic Acid should be purified as follows: To 1 part of the Acid add 10 parts of cold Water, and shake until the latter is saturated. Filter off the solution from the undissolved crystals, evaporate the filtrate to about three-fourths of its volume, and set it aside so that the fixed salts which it contains may crystallise out. Carefully decant the liquid from the crystals, concentrate it by evaporation, and set it aside to crystallise, stirring occasionally to prevent the formation of large crystals, which might enclose moisture. Drain the crystals in a funnel, dry them carefully on blotting paper, and preserve them in well-stoppered bottles.

OXALIC ACID SOLUTION.

B.P. *P.G.* } Not included.

U.S.P.—A 10 p.c. w/v aqueous solution of pure Oxalic Acid.

PALLADOUS CHLORIDE SOLUTION.

B.P. *P.G.* } Not included.

U.S.P.—A 5 p.c. w/v aqueous solution of Palladous Chloride $PdCl_2$. The solution should be preserved in a glass-stoppered bottle.

PHENOL.

B.P.—The 'Acidum Carbolicum' of the Pharmacopœia.

P.G. *U.S.P.* } Not included in the reagent list.

PHENOL SOLUTION.

B.P. *U.S.P.* } Not included.

P.G.—A 5 p.c. w/w aqueous solution of Carbolic Acid.

PICRIC ACID.

B.P.—Trinitrophenol represented by the formula $C_6H_2(NO_2)_3OH$. *See* also Acidum Picricum.

P.G. *U.S.P.* } Not included.

PICRIC ACID SOLUTION.

B.P.—A 0·6 p.c. w/v aqueous solution of Picric Acid.

P.G.—Not included.

U.S.P.—A 1 p.c. w/v aqueous solution of pure, distinctly crystalline Picric Acid $C_6H_2(NO_2)_3OH$. Cool the solution and filter if necessary.

PLATINIC CHLORIDE SOLUTION.

B.P.—An approximately 8·6 p.c. solution of Platinum Tetrachloride, equivalent to 13·2 p.c. w/v Chloro-platinic Acid, obtained by heating 5 grammes of commercial platinum foil to a temperature of about 80° C. (176° F.) with 30 c.c. of Hydrochloric Acid, and very gradually adding 5 c.c. of Nitric Acid. The liquid is evaporated to dryness on a water-bath moistened with Hydrochloric Acid, and again evaporated and the residue dissolved in sufficient Water to measure 100 c.c.

P.G.—A 5 p.c. w/w solution of Chloro-platinic Acid in Water.

U.S.P.—A solution of 2·6 grammes of Chloro-platinic Acid $H_2PtCl_6, 6H_2O$ in 20 c.c. of Water. It is required that if a small portion of this solution be evaporated to dryness and the residue ignited, pure metallic Platinum should remain, which should yield nothing soluble in Nitric Acid.

POTASSIO-MERCURIC IODIDE ALKALINE SOLUTION (NESSLER'S).

B.P.—A solution prepared by dissolving a mixture of 3·5 grammes of Potassium Iodide and 1·25 grammes of Mercuric Chloride in 80 c.c. of Water, adding a cold saturated aqueous Mercuric Chloride Solution drop by drop with constant agitation until a faint permanent red precipitate ensues, adding 12 grammes of Sodium Hydroxide, 1 or 2 drops of the cold saturated aqueous Mercuric Chloride Solution and diluting with Water to measure 100 c.c.

U.S.P.—To a solution of 5 grammes of Potassium Iodide in 5 c.c. of Water gradually add in portions a saturated aqueous solution of Mercuric Chloride with constant agitation until a slightly red precipitate remains undissolved. Add 15 grammes of Potassium Hydroxide, and, when this has dissolved, 0·5 c.c. more of the saturated aqueous solution of Mercuric Chloride, then dilute with Water to 100 c.c. Allow the precipitate to subside and draw off the clear fluid. 2 c.c. of this reagent when added to 50 c.c. of Water containing 0·05 milligramme of Ammonia should produce at once a yellowish-brown coloration.

P.G.—Not included.

POTASSIO-MERCURIC IODIDE SOLUTION. MAYER'S REAGENT.

B.P.
P.G. } Not included.

U.S.P.—Dissolve 1·344 grammes of Mercuric Chloride in 60 c.c. of Water and 5 grammes of Potassium Iodide in 10 c.c. of Water. Mix the two solutions, and then add sufficient Water to make the mixture measure 100 c.c.

POTASSIUM ACETATE SOLUTION.

B.P.—A 10 p.c. w/v filtered aqueous solution of Potassium Acetate.

P.G.—The Liquor Kalii Acetici of the Pharmacopœia prepared by gradually adding 24 parts of Potassium Bicarbonate to 50 parts by weight of diluted Acetic Acid, *P.G.*, heating the solution to boiling point, then neutralising with Potassium Bicarbonate and diluting the cooled liquid with Water until the solution has a sp. gr. of 1·176 to 1·180.

U.S.P.—Not included.

POTASSIUM ACID TARTRATE SOLUTION.

B.P.—A saturated solution of the official salt obtained by digesting an excess of it in Distilled Water and then filtering.

P.G.
U.S.P. } Not included.

POTASSIUM BICHROMATE.

B.P.—The official salt of the Pharmacopœia. *See* Potassii Bichromas.
P.G.—Not included.
U.S.P.—Pure Potassium Dichromate. The pure salt $K_2Cr_2O_7$ answering the following tests of purity in addition to the official requirements: In a solution of 0·5 gramme of the salt in 10 c.c. of Water rendered acid by 0·5 c.c. of Nitric Acid, no turbidity should be produced by Barium Chloride T.S. (absence of Sulphates). 10 c.c. of an aqueous solution of the salt (1–20) should give no turbidity with 1 c.c. of Ammonia Water followed by 1 c.c. of Ammonium Oxalate T.S. (absence of Calcium). If to a solution of 0·5 gramme of the salt in 20 c.c. of Water sufficient Sulphurous Acid be added to impart a strong odour of the reagent and the mixture be boiled for about 3 minutes and cooled, the addition of 1 c.c. of Nitric Acid and a few drops of Silver Nitrate V.S. should produce no turbidity (absence of Chlorides). Should the official salt not answer these tests it may be purified by repeated recrystallisation until it does so. A hot saturated aqueous solution of the salt is rapidly cooled with agitation and the granular crystals collected on a plain filter, washed with cold Water to remove the mother liquor, drained and then dried at 120° C. (248° F.). This recrystallisation is repeated as often as is necessary.

POTASSIUM BICHROMATE SOLUTION.

B.P.—Not included.
P.G.—A 5 p.c. w/w aqueous solution of the official salt.
U.S.P.—A 10 p.c. w/v aqueous solution of the pure salt.

POTASSIUM BROMATE.

B.P., *P.G.*—Not included.
U.S.P.—The salt represented by the chemical formula $KBrO_3$. It occurs as white cubical crystals or a granular crystalline powder, and has a pungent saline taste. It should respond to the following tests:—**Solubility:** 1 in 15·5 of Water at 25° C. (77° F.); 1 in 2 of boiling Water; slightly in Alcohol. **Litmus:** An aqueous solution should be neutral. **Sulphuric Acid:** The aqueous solution of the salt should not at once yield a yellow colour on the addition of the diluted acid, but Sulphuric Acid added to the salt causes decomposition with evolution of Bromine. **Nitric Acid:** Also causes decomposition with evolution of Bromine. **Heat:** At 350° C. (662° F.) decomposition occurs and Oxygen is given off. **Volumetric determination:** Dissolve 0·1 gramme of the salt which has been dried at 100° C. (212° F.) and 2 grammes of Potassium Iodide in 25 c.c. of Water contained in a glass-stoppered bottle of about 100 c.c. capacity; then add 5 c.c. of Hydrochloric Acid, well stopper the bottle and set aside for ten minutes. On titrating this mixture with Tenth-normal Sodium Thiosulphate V.S. not less than 36·1 c.c. of the V.S. should be required to discharge the colour, corresponding to 99·8 p.c. of pure salt.
Note.—Potassium Bromate should not be triturated or heated with organic or easily oxidisable substances.

POTASSIUM CARBONATE SOLUTION.

B.P.—A 10 p.c. w/v filtered aqueous solution of Potassium Carbonate.
P.G.—The 'Liquor Kalii Carbonici' of the Pharmacopœia made by dissolving 11 parts of the salt in 20 parts of Water, filtering the solution and diluting with Water if necessary to a sp. gr. of 1·330 to 1·334. It is an aqueous solution containing 33·3 p.c. w/w of Potassium Carbonate.
U.S.P.—A 10 p.c. w/v aqueous solution of anhydrous Potassium Carbonate. The anhydrous salt is prepared by heating the official salt to 130° C. (266° F.).

POTASSIUM CHLORATE.

B.P.—The official salt of the Pharmacopœia. *See* Potassii Chloras.
P.G., *U.S.P.*—Not included.

POTASSIUM CHROMATE.

B.P.—The pure neutral commercial salt in yellow crystals represented by the chemical formula K_2CrO_4.

P.G.
U.S.P. } Not included.

POTASSIUM CHROMATE SOLUTION.

B.P.—A 10 p.c. w/v filtered aqueous solution of Potassium Chromate.

P.G.—A 5 p.c. w/w aqueous solution of yellow Potassium Chromate free from Chlorine.

U.S.P.—A 10 p.c. w/v aqueous solution of yellow Potassium Chromate. The red precipitate produced by the addition of Silver Nitrate T.S. to a few drops of the solution, diluted with a little Distilled Water, should be entirely soluble in Nitric Acid (absence of Chlorides). It should be free from Sulphates; equal volumes of the solution and diluted Hydrochloric Acid yielding no precipitate with Barium Chloride T.S. Another portion of the solution should give no turbidity with Ammonia Water or Ammonium Oxalate T.S. (absence of alkali earths). A solution of 0·1 gramme of the salt in 20 c.c. of Water should not become red on the addition of a few drops of Phenolphthalein T.S. (limit of free alkalis).

POTASSIUM CYANIDE.

B.P.—The Potassium Cyanide, KCN, of commerce yielding not less than 90 p.c. of pure salt.

P.G.
U.S.P. } Not included.

POTASSIUM CYANIDE SOLUTION.

B.P.
U.S.P. } A 10 p.c. w/v aqueous solution of Potassium Cyanide. (*B.P.* filtered.)

The *U.S.P.* uses the official salt of the Pharmacopœia and directs that the solution be prepared when required.

P.G.—Not included.

POTASSIUM FERRICYANIDE.

B.P.—The salt represented by the chemical formula $K_6Fe_2C_{12}N_{12}$. It occurs as red crystals and should be free from Ferrous salt as ascertained by its aqueous solution failing to give a precipitate or blue coloration with a dilute solution of a pure Ferric salt.

P.G.
U.S.P. } Not included.

POTASSIUM FERRICYANIDE SOLUTION.

B.P.—A freshly prepared 5 p.c. w/v aqueous filtered solution of crystallised Potassium Ferricyanide.

P.G.—A freshly prepared 5 p.c. w/w aqueous solution of Potassium Ferricyanide in crystals which have been previously washed with Water.

U.S.P.—A solution of 1 part of Potassium Ferricyanide in about 10 parts of Water, freshly made when required. The absence of Ferrocyanide is proved by its failure to give any turbidity or shade of green with Ferric Chloride T.S. well diluted with Water, only a brown tint being developed. Potassium Ferricyanide should be free from Sulphates and Chlorides.

POTASSIUM FERROCYANIDE.

B.P.—The salt in yellow crystals obtained by the fusion of a mixture of Potassium Carbonate, Iron and nitrogenous organic matter. It is represented by the chemical formula $K_4FeC_6N_6$, $3H_2O$.

P.G.—Not included.

U.S.P.—The yellow crystalline salt represented by the formula $K_4Fe(CN)_6$, $3H_2O$.

POTASSIUM FERROCYANIDE SOLUTION.

B.P.—A 5 p.c. w/v aqueous filtered solution of Potassium Ferrocyanide in crystals.

P.G.—A freshly prepared 5 p.c. w/w aqueous solution of Potassium Ferrocyanide.

U.S.P.—A 10 p.c. w/v aqueous solution of the salt.

POTASSIUM HYDROGEN SULPHITE.

B.P.—Acid Potassium Sulphite of commerce represented by the chemical formula $KHSO_3$.

P.G.
U.S.P. } Not included.

POTASSIUM HYDROXIDE.

B.P.—The Potassa Caustica of the Pharmacopœia.

P.G.
U.S.P. } Not included.

POTASSIUM HYDROXIDE SOLUTION.

B.P.
P.G. } The solutions official in the respective Pharmacopœias.
U.S.P.

POTASSIUM HYDROXIDE SOLUTION (ALCOHOLIC).

B.P.—A 10 p.c. w/v filtered solution of Potassium Hydroxide in Alcohol (90 p.c.).

P.G.—A 10 p.c. w/w solution of fused Potassium Hydroxide in Alcohol (90 to 91·2 p.c.).

U.S.P.—Use the Half-normal Alcoholic Potassium Hydroxide V.S., *q.v.* p. 1301.

POTASSIUM IODIDE.

B.P.—The official salt of the Pharmacopœia.

P.G.
U.S.P. } Not included.

POTASSIUM IODIDE SOLUTION.

B.P.—A 10 p.c. w/v filtered aqueous solution of the official Potassium Iodide.

P.G.—A 10 p.c. w/w aqueous solution of the official salt.

U.S.P.—A 20 p.c. w/v aqueous solution of the official salt. It should be kept in dark amber-coloured, well-stoppered bottles, and should be frequently renewed.

POTASSIUM NITRATE.

B.P.
P.G. } Not included.

U.S.P.—The dry salt, KNO_3, official in the Pharmacopœia. It should also be free from Chlorides and Sulphates.

POTASSIUM PERMANGANATE.

B.P.—The official salt of the Pharmacopœia.

P.G.
U.S.P. } Not included.

POTASSIUM PERMANGANATE SOLUTION.

B.P.—The 'Liquor Potassii Permanganatis' of the Pharmacopœia.

P.G.—A 0·1 p.c. w/w aqueous solution of the official salt.

U.S.P.—Use the Tenth-normal Volumetric Solution.

POTASSIUM SULPHATE.

B.P.—The official salt of the Pharmacopœia.
P.G., *U.S.P.*—Not included.

POTASSIUM SULPHATE SOLUTION.

B.P., *P.G.*—Not included.
U.S.P.—A 1 p.c. w/v aqueous solution of Potassium Sulphate.

POTASSIUM SULPHOCYANATE.

B.P., *P.G.*—Not included.

U.S.P.—The salt represented by the chemical formula KSCN. It is in the form of colourless prismatic crystals, which are hygroscopic in moist air. It has a cooling saline taste. **Solubility** at 25° C. (77° F.): 1 in less than 1 of Water; 1 in 10 of Absolute Alcohol. An aqueous solution of the salt (1–20) should not become turbid within 5 minutes upon the addition of Barium Chloride T.S. (limit of Sulphate). The aqueous solution (1 in 20) after the addition of 1 c.c. of diluted Hydrochloric Acid, should remain colourless (absence of Iron), and should not respond to the time-limit test for heavy metals.

POTASSIUM SULPHOCYANATE SOLUTION.

B.P., *P.G.*—Not included.
U.S.P.—Use the Tenth-normal V.S.

PYROXYLIN SOLUTION.

B.P.—The Collodion official in the Pharmacopœia.
P.G., *U.S.P.*—Not included.

SILVER AMMONIO-NITRATE SOLUTION.

B.P.—A solution obtained by dissolving 2·5 grammes of Silver Nitrate in 80 c.c. of Distilled Water, and adding Ammonia Solution drop by drop until the precipitate at first formed almost redissolves; the clear liquid is decanted from the precipitate and sufficient Water added to measure 100 c.c.

P.G.—Not included.

U.S.P.—Prepared by adding, drop by drop, Ammonia Water *q.s.* to a solution of 1 gramme of Silver Nitrate in 20 c.c. of Water until solution of the precipitate formed is nearly, but not entirely, effected. Filter and preserve the solution in dark amber-coloured and well-stoppered bottles.

SILVER NITRATE SOLUTION.

B.P.—A 5 p.c. w/v aqueous solution of the official salt.
P.G.—A 5 p.c. w/w aqueous solution of the official salt.
U.S.P.—For ordinary purposes use the Tenth-normal Volumetric Solution.

SILVER SULPHATE SOLUTION.

B.P., *P.G.*—Not included.

U.S.P.—To a solution of 1 gramme of the official Silver Nitrate in 0·5 c.c. of warm Water add 1·5 c.c. of pure concentrated Sulphuric Acid, cool the solution, and pour off the acid liquid from the crystals of Silver Sulphate $AgSO_4$ formed. Repeatedly wash the crystals by decantation with cold Water, and having transferred them to a bottle, agitate them with 100 c.c. of Water. Decant a sufficient quantity of this saturated solution when required.

SODIUM ACETATE.

B.P.—The salt represented by the chemical formula $CH_3COONa, 3H_2O$. The use of the pure commercial salt is officially permitted.

P.G.
U.S.P.} Not included.

SODIUM ACETATE SOLUTION.

B.P.—A 10 p.c. w/v filtered aqueous solution of the salt.
P.G.—A 20 p.c. w/w aqueous solution of the official salt.
U.S.P.—A 10 p.c. w/v aqueous solution of the official salt.

SODIUM ARSENATE.

B.P.—The official salt of the Pharmacopœia.

P.G.
U.S.P.} Not included.

SODIUM BICARBONATE.

B.P.—The official salt of the Pharmacopœia.

P.G.
U.S.P.} Not included.

SODIUM BICARBONATE SOLUTION.

B.P.
U.S.P.} Not included.

P.G.—Dissolve 1 part of the powdered salt in 19 parts of Water with gentle stirring.

SODIUM BITARTRATE SOLUTION.

B.P.
P.G.} Not included.

U.S.P.—To a solution of 3·5 grammes of the official Tartaric Acid in about 80 c.c. of boiling Water, add gradually, in small portions, Monohydrated Sodium Carbonate Na_2CO_3,H_2O until the solution has a neutral reaction; to this liquid is now added 3·5 grammes of Tartaric Acid, and after filtering and cooling sufficient Water is added to the solution to measure 100 c.c. This solution should be freshly prepared when required.

SODIUM CARBONATE.

B.P.—The official salt of the Pharmacopœia.
P.G.—Not included.
U.S.P.—The official monohydrated salt Na_2CO_3,H_2O. It should respond to the tests of the Pharmacopœia, and should be absolutely free from Chloride and Sulphate.

SODIUM CARBONATE SOLUTION.

B.P.—A 10 p.c. w/v filtered aqueous solution of the official salt.
P.G.—A 20 p.c. w/w aqueous solution of the official salt.
U.S.P.—A 10 p.c. w/v aqueous solution of the 'Sodii Carbonas Monohydratus' of the Pharmacopœia.

SODIUM CHLORIDE.

B.P.—The official salt of the Pharmacopœia.

P.G.
U.S.P.} Not included.

SODIUM COBALTIC NITRITE SOLUTION.

B.P.
P.G.} Not included.

U.S.P.—A solution of Sodium Cobaltic Nitrite $Co_2(NO_2)_6.6NaNO_2,H_2O$ made by dissolving 4 grammes of Cobaltous Nitrate $Co(NO_3)_2,6H_2O$ and 10 grammes of Sodium Nitrite $NaNO_2$ in about 50 c.c. of Water, then adding 2 c.c. of Acetic

Acid (*U.S.P.*) and diluting with Water to 100 c.c. A few drops of Acetic Acid should be added to the solution from time to time, and it should not be kept longer than three months.

SODIUM HYDROGEN SULPHITE.

B.P.—The salt $NaHSO_3$ found in commerce.

P.G. } Not included.
U.S.P. }

SODIUM BISULPHITE SOLUTION.

B.P. } Not included.
U.S.P. }

P.G.—It contains about 30 p.c. w/w of Sodium Bisulphite.

SODIUM HYDROXIDE.

B.P.—For the official varieties *see* Soda Caustica.

P.G.—The *P.G.* uses the fused Caustic Soda and requires that an aqueous solution (1-6) should respond to the tests of purity given for the 'Liquor Natri Caustici' of the Pharmacopœia.

U.S.P.—Not included.

SODIUM HYDROXIDE SOLUTION.

B.P.—A 20 p.c. w/v filtered aqueous solution of the 'Purified Sodium Hydroxide.'

P.G.—The 'Liquor Natri Caustici' of the Pharmacopœia. Sp. gr. 1·168 to 1·172. It contains about 15 p.c. w/w of Sodium Hydroxide.

U.S.P.—The 'Liquor Sodii Hydroxidi' of the Pharmacopœia. Sp. gr. 1·056 at 25° C. (77° F.). It contains about 5 p.c. w/w of Sodium Hydroxide.

SODIUM NITRITE.

B.P.—The official salt of the Pharmacopœia.

P.G.—Not included.

U.S.P.—The purest commercial salt, either granulated or in the form of sticks may be employed.

SODIUM NITRO-PRUSSIDE SOLUTION.

B.P. } Not included.
P.G. }

U.S.P.—An aqueous solution of Sodium Nitro-prusside $Na_2Fe(NO)(CN)_5, 2H_2O$, prepared immediately before use by dissolving 1 part of the salt in 19 parts of Water.

SODIUM PHOSPHATE SOLUTION.

B.P. } A 10 p.c. w/v filtered aqueous solution of the salt official in the
U.S.P. } respective Pharmacopœias.

P.G.—A 5 p.c. w/w aqueous solution of the official salt.

SODIUM POTASSIUM TARTRATE.

B.P.—The 'Soda Tartarata' of the Pharmacopœia.

P.G. } Not included.
U.S.P. }

SODIUM SULPHATE.

B.P.—The official salt of the Pharmacopœia.

P.G. } Not included.
U.S.P. }

SODIUM SULPHATE SOLUTION.

B.P.—A 10 p.c. w/v filtered aqueous solution of the official salt.

P.G. } Not included.
U.S.P. }

SODIUM SULPHITE.

B.P.—The official salt of the Pharmacopœia.

P.G.
U.S.P. } Not included.

SODIUM SULPHITE SOLUTION.

B.P.
U.S.P. } Not included.

P.G.—A 10 p.c. w/w aqueous solution of Sodium Sulphite. It should be prepared when required.

SODIUM TARTRATE SOLUTION.

B.P.
P.G. } Not included.

U.S.P.—A solution of Sodium Tartrate $Na_2C_4H_4O_6$, $2H_2O$ prepared by adding gradually, in small portions, Monohydrated Sodium Carbonate *U.S.P.* to a solution of 6·5 grammes of Tartaric Acid *U.S.P.* in about 80 c.c. of boiling Water, until the solution has a neutral reaction. It is then filtered, cooled, and made up to 100 c.c. with Water. It should be freshly prepared when required.

SODIUM THIOSULPHATE.

B.P.—*Syn.* Sodium Hyposulphite. A crystalline salt represented by the chemical formula $Na_2S_2O_3$, $5H_2O$.

P.G.
U.S.P. } Not included.

SODIUM THIOSULPHATE SOLUTION.

B.P.
P.G. } Not included.

U.S.P.—Use the Tenth-normal V.S.

STANNOUS CHLORIDE SOLUTION.

B.P.—A solution of Stannous Chloride obtained by heating 20 grammes of granulated Tin with a mixture of 60 c.c. of Hydrochloric Acid and 20 c.c. of Water until the evolution of gas ceases, the undissolved Tin is allowed to remain in the liquid, to which sufficient Water should be added to measure 100 c.c.

P.G.—Let 5 parts of Stannous Chloride in crystals be mixed to a paste with 1 part of Hydrochloric Acid and the mixture completely saturated with dry Hydrochloric Acid gas. The solution so obtained is poured off after being allowed to deposit, and filtered through Asbestos. It is a pale yellow, strongly fuming, refractive liquid with a sp. gr. of not less than 1·900. The solution mixed with 10 volumes of Spirit should not become turbid even in the course of an hour. No turbidity should be produced by Barium Chloride Solution (1–20) in Stannous Chloride Solution diluted with 10 volumes of Water, even after ten minutes. The solution should be preserved in small well-stoppered bottles as full as possible.

U.S.P.—A solution of 1 part Stannous Chloride in crystals, in 10 parts of Water. The crystals of Stannous Chloride are prepared by heating Tin (in foil or granules) with concentrated Hydrochloric Acid, keeping the metal in excess. When the Acid is saturated, crystals of Stannous Chloride, $SnCl_2$, $2H_2O$ begin to form. These are removed and drained, and are then used in making the solution.

The solution should be preserved in well-stoppered bottles containing a fragment of pure Tin or a piece of Tin foil.

For Bettendorf's test pure concentrated Hydrochloric Acid (which responds to the *U.S.P.* tests of purity) is saturated with the freshly prepared crystals.

SULPHANILIC ACID SOLUTION.

B.P.
P.G. } Not included.

U.S.P.—A solution of 0·5 gramme of Sulphanilic Acid $C_6H_4(NH_2).(SO_3H)$ (Para-amidobenzenesulphonic acid) in 150 c.c. of diluted Acetic Acid (10 p.c.

absolute Acetic Acid). Only freshly distilled Water should be employed in preparing the diluted Acetic Acid and the reagent should be kept in well-stoppered bottles.

SULPHUR.

B.P.—The 'Sulphur Sublimatum' of the Pharmacopœia.

P.G. }
U.S.P. } Not included.

SULPHURIC ACID.

B.P. }
P.G. } The acids official in the respective Pharmacopœias.

U.S.P.—The official acid may be used as a reagent for most purposes, provided it is of the required degree of purity. If 'concentrated' Sulphuric Acid be specially directed in a test, the strongest obtainable pure acid, sp. gr. not less than 1·834 at 25°C. (77° F.), should be used. This acid should respond to the official tests of purity and conform to the following additional test:—'If 1 c.c. of Diphenylamine T.S. be carefully poured, as a separate layer, upon 5 c.c. of Sulphuric Acid contained in a test-tube, no distinct blue colour should appear in the zone of contact.'

SULPHURIC ACID, DILUTED.

B.P. }
P.G. } The diluted acid of the respective Pharmacopœias.

U.S.P.—Not included.

SULPHUROUS ACID (SOLUTION).

B.P.—The 'Acidum Sulphurosum' of the Pharmacopœia.

P.G.—The reagent is prepared when required by acidulating a freshly prepared solution (1–10) of Sodium Sulphite with diluted Sulphuric Acid.

U.S.P.—Not included.

TALC (POWDERED).

B.P.—A purified Magnesium Silicate. *See* Talcum.

P.G. }
U.S.P. } Not included.

TANNIC ACID SOLUTION.

B.P.—A freshly prepared 10 p.c. w/v aqueous solution of Tannic Acid.

P.G.—A 5 p.c. w/w solution of Tannic Acid in Water, prepared when required.

U.S.P.—A solution of 1 gramme of Tannic Acid *U.S.P.* in 1 c.c. of Alcohol diluted with Water to 10 c.c.

TARTARATED ANTIMONY SOLUTION.

B.P.—A freshly prepared 5 p.c. w/v filtered solution of Tartarated Antimony in boiling Water.

P.G. }
U.S.P. } Not included.

TARTARIC ACID.

B.P.—The official 'Acidum Tartaricum' of the Pharmacopœia.

P.G. }
U.S.P. } Not included.

TARTARIC ACID SOLUTION.

B.P.—A solution obtained by dissolving 12·5 grammes of Tartaric Acid in 65 c.c. of Water, mixing with 25 c.c. of Alcohol (90 p.c.) and adding sufficient Water to measure 100 c.c.

P.G.—A freshly prepared 20 p.c. w/w aqueous solution of Tartaric Acid.

U.S.P.—A freshly prepared solution of 1 part of the Acidum Tartaricum *U.S.P.* in 3 parts of Water.

TIN.

B.P. *U.S.P.*} The metal Tin in the granulated form. The *B.P.* requires that it should not respond to the tests for Lead, Copper, Iron or Zinc. The *U.S.P.* requires that it should be free from Lead, indicated by its solution in Hydrochloric Acid failing to give a precipitate with Potassium Sulphate T.S. When tested by the modified Gutzeit's test replacing the Zinc by Tin, the diluted Hydrochloric Acid by Hydrochloric Acid *U.S.P.*, and adding 1 drop of Platinic Chloride T.S., the Mercuric Chloride cap should not become coloured within the time required for the solution of the metal (absence of Arsenic).

P.G.—Tin foil free from Lead is to be employed.

TURPENTINE, OIL OF.

B.P.—The 'Oleum Terebinthinæ' of the Pharmacopœia.

P.G. *U.S.P.*} Not included.

URANIUM NITRATE.

B.P.—Pure commercial Uranium Nitrate in crystals.

P.G. *U.S.P.*} Not included.

URANIUM NITRATE SOLUTION.

B.P.—A 5 p.c. w/v aqueous solution of Uranium Nitrate.

P.G. *U.S.P.*} Not included.

WATER.

B.P.—The 'Aqua Destillata' of the Pharmacopœia.

P.G. *U.S.P.*} Not included.

ZINC.

B.P.—The metal in sheet or granular form. *See* Zincum.

P.G.—The *P.G.* employs also Zinc filings.

U.S.P.—The pure metallic Zinc of the Pharmacopœia.

VOLUMETRIC ANALYSIS.

STANDARDISED SOLUTIONS EMPLOYED IN VOLUMETRIC ANALYSIS

AND

INDICATORS OF NEUTRALITY.

Solutions standardised to contain definite molecular equivalents of various chemical substances are used in the British, United States, and German as well as other Pharmacopœias, for the purpose of determining the quantity of other ingredients with which they enter into reaction in accordance with the laws of chemical equivalence and which are present in unknown quantity.

A Normal Solution is defined as one containing in each 1000 c.c. such an amount of the active constituent as will combine with, replace or oxidise 1 gramme of Hydrogen. The *B.P.* does not define what is meant by a Normal Solution. The *U.S.P.* defines Normal Volumetric Solutions as those which contain in 1 litre in any stated reaction the chemical equivalent of 1 gramme of Hydrogen. It draws attention to the relative weight in grammes required for 1 litre, depending on whether the molecule of the active ingredient is univalent, bivalent or trivalent. The *B.P.* employs measuring apparatus which is adjusted at a temperature of 15·5° C. (60° F.). The *U.S.P.* mentions that it is absolutely necessary that the measuring vessels should agree amongst themselves accurately in their graduation at the standard temperature, but that it is immaterial what standard temperature has been selected for the graduation of the vessels. All the *U.S.P.* Volumetric Solutions must be prepared at a temperature of 25° C. (77° F.), and it is further required that in carrying out titrations with these solutions the temperature should not be below 21° C. (69·8° F.) nor above 29° C. (84·2° F.). The *P.G.* gives no general directions for the temperatures to be observed nor the method to be followed in preparing solutions for Volumetric analysis.

The tabulated list below shows the Volumetric Solutions which are official in the three Pharmacopœias dealt with in this volume, *e.g.*, the *B.P.*, *U.S.P.* and *P.G.*

B.P. Volumetric Sulphuric Acid Solution.
Deci-normal Volumetric Sulphuric Acid Solution.
Volumetric Sodium Hydroxide Solution.
Deci-normal Volumetric Sodium Hydroxide Solution.
Normal Alcoholic Sodium Hydroxide Solution.
Deci-normal Alcoholic Sodium Hydroxide Solution.
Normal Alcoholic Potassium Hydroxide Solution.
Deci-normal Volumetric Alcoholic Potassium Hydroxide Solution.
Volumetric Iodine Solution.
Volumetric Potassium Bichromate Solution.
Volumetric Silver Nitrate Solution.
Volumetric Sodium Thiosulphate Solution.

U.S.P. Normal Volumetric Sulphuric Acid Solution.
Half-normal Volumetric Sulphuric Acid Solution.
Tenth-normal Volumetric Sulphuric Acid Solution.
Fiftieth-normal Volumetric Sulphuric Acid Solution.
Double-normal Volumetric Sodium Hydroxide Solution.
Normal Volumetric Sodium Hydroxide Solution.
Normal Volumetric Potassium Hydroxide Solution.

Tenth-normal Volumetric Potassium Hydroxide Solution.
Fiftieth-normal Volumetric Potassium Hydroxide Solution.
Hundredth-normal Volumetric Potassium Hydroxide Solution.
Half-normal Volumetric Alcoholic Potassium Hydroxide Solution.
Normal Volumetric Hydrochloric Acid Solution.
Half-normal Volumetric Hydrochloric Acid Solution.
Tenth-normal Volumetric Oxalic Acid Solution.
Tenth-normal Volumetric Iodine Solution.
Tenth-normal Volumetric Bromine Solution.
Tenth-normal Volumetric Potassium Dichromate Solution.
Tenth-normal Volumetric Potassium Permanganate Solution.
Tenth-normal Volumetric Potassium Sulphocyanate Solution.
Tenth-normal Volumetric Silver Nitrate Solution.
Tenth-normal Volumetric Sodium Chloride Solution.
Tenth-normal Volumetric Sodium Thiosulphate Solution.
Volumetric Alkali Cupric Tartrate Solution.

P.G. Normal Volumetric Hydrochloric Acid Solution.
Half-normal Volumetric Hydrochloric Acid Solution.
Tenth-normal Volumetric Hydrochloric Acid Solution.
Hundredth-normal Volumetric Hydrochloric Acid Solution.
Normal Volumetric Potassium Hydroxide Solution.
Tenth-normal Volumetric Potassium Hydroxide Solution.
Hundredth-normal Volumetric Potassium Hydroxide Solution.
Half-normal Volumetric Alcoholic Potassium Hydroxide Solution.
Tenth-normal Volumetric Iodine Solution.
Tenth-normal Volumetric Sodium Thiosulphate Solution.
Tenth-normal Volumetric Silver Nitrate Solution.
Tenth-normal Volumetric Ammonium Rhodanate Solution.

Preparing and Setting Solutions for Volumetric Analysis.—For the proper performance of Volumetric work it is necessary to employ the following pieces of apparatus :—

A burette (preferably Mohr's) fitted with a glass stop-cock, graduated from 0 to 50 c.c. and subdivided into c.c. and into $\frac{1}{10}$ c.c.

Pipettes. A series of pipettes graduated to deliver 10, 15, 20, 25, 50 and 100 c.c.

A graduated glass cylinder, preferably stoppered, graduated at 1000 c.c., the intermediate graduations being 100 c.c. subdivided into 10 c.c. It should be capable of holding when filled to the zero mark 1000 grammes of Distilled Water at 15·5° C. (60° F.), and should have preferably an ascending and descending scale.

A stoppered glass measuring flask with single graduation, holding when filled to the mark on the neck 1000 c.c. of Distilled Water, and capable of containing 1000 grammes of Distilled Water at 15·5° C. (60° F.). This flask is commonly known as a litre flask, though it must be borne in mind that a standard litre represents the volume occupied by 1000 grammes (1 kilogramme) of Distilled Water at 4° C. (39·2° F.), the temperature of its maximum density, and at a pressure of 760 mm. of Mercury. 1 millilitre, one-thousandth part of this standard litre, is equivalent to 1·00016 c.c., or 1 c.c. is equivalent to 0·99984 millilitre. The term 'mille' has been suggested as an abbreviation of a millilitre to more accurately describe the one-thousandth part of a litre. Unless marked to the contrary, it is assumed that litre flasks, or any similar graduated glass measuring vessels, have reference to the standard litre graduated at the above-named temperature [4° C. (39·2° F.)]. The *B.P.* gives a caution (which will probably be considered unnecessary), to shake the Volumetric Solutions before use to ensure uniformity, and a note regarding their preservation in stoppered bottles, but omits to mention the necessity of ensuring the cleanliness of the bottles and the necessity for washing thoroughly. The *U.S.P.* directs that all bottles in which Volumetric Solutions are to be kept, as well as the other measuring vessels employed, should before use be thoroughly rinsed in Distilled Water, and then with two or three small portions of the solutions which they are about to contain, and that when not in use the apparatus should be kept filled with Distilled Water. The *P.G.* does not give directions for the observance of any special precautions. It is extremely important that great attention should be observed in setting Normal Solutions, as any experimental error is greatly magnified when Fiftieth-normal and Hundredth-normal Solutions are prepared from them. These weaker strength solutions should in every case be carefully set before being used for titration, and either adjusted to a strictly correct content, or else a factor ascertained by which the number of c.c. may be converted into those of a strictly correct solution.

VOLUMETRIC SULPHURIC ACID SOLUTION.

Normal Solution of Sulphuric Acid should contain in each litre a weight equivalent in grammes to one half its molecular weight, that is to say, it should contain $97 \cdot 34 \div 2 = 48 \cdot 67$ grammes of pure Hydrogen Sulphate. In preparing the solution a useful method is to carefully weigh out in a clean, dry, stoppered weighing bottle 1 gramme of the Sulphuric Acid to be used in the preparation of the solution, pour it carefully into a small volume of Distilled Water, rinse out the weighing bottle with several small successive quantities of Distilled Water, and determine the weight of pure Hydrogen Sulphate present by titration with Normal Volumetric Sodium Hydroxide Solution, using a few drops of Phenolphthalein Solution as an indicator of neutrality. The Normal Volumetric Sodium Hydroxide Solution is prepared and set in a manner to be hereafter described. Having ascertained the quantity of Hydrogen Sulphate present, the quantity necessary to produce a solution containing a slight excess of the normal amount is weighed out and poured gradually and in small portions at a time into about 500 c.c. of the Distilled Water, the mixture being kept well cooled during the addition. When thoroughly mixed the solution is made up to 1000 c.c., and the mixture well shaken. A portion of the solution is then transferred to a burette, and the exact number of c.c. required to neutralise the molecular equivalent of pure dry Sodium Carbonate determined, Methyl Orange Solution being used as an indicator of neutrality. The balance of the acid remaining in the burette is returned to the original vessel, its volume ascertained, and it is then diluted in the proportion of the number of c.c. which it has actually required to the number of c.c. which it should have required had it been strictly normal. As an example, assuming that the titration of the 1 gramme of Sulphuric Acid has shown that the acid contains 98 p.c. of pure Hydrogen Sulphate; then the quantity necessary to produce a solution containing a little over 48·67 grammes per litre would be the following proportion—as 98 is to 100 so is 48·67 to x, viz., 49·66 grammes, so that in round numbers about 50 grammes should be weighed out, or, if it be preferred to measure the quantity, about 27 c.c. It should be mixed as described above, and the solution set against the pure dry Sodium Carbonate obtained by igniting pure powdered Sodium Bicarbonate. A quantity of 1·0531 grammes of the pure dry Sodium Carbonate is weighed out, and the Sulphuric Acid Solution added from a burette. The number of c.c. required is noted, and the solution diluted accordingly. Assuming that 950 c.c. of the solution remain after titration, and that x represents the number of c.c. of Sulphuric Acid Solution required to neutralise the above weight of pure dry Sodium Carbonate, it will be required to be diluted in the proportion of x is to 20 so is 950. In order to ensure the correctness of the dilution the solution should be reset.

B.P.—The *B.P.* employs a weighed quantity of 50 grammes of Sulphuric Acid, which it dilutes with 900 c.c. of Distilled Water, presumably adding the Distilled Water to the acid, which is a dangerous method of proceeding. It employs titration against pure dry Sodium Carbonate (obtained from the ignition of Sodium Bicarbonate) as a means of setting the acid, but presumably refers to Litmus as an indicator of neutrality, as it inserts a caution to boil off the Carbonic Anhydride. The use of Methyl Orange Solution as an indicator, as described above, obviates the necessity of boiling off Carbonic Anhydride and shortens the time required for the titration.

U.S.P.—The *U.S.P.* prepares Normal Volumetric Sulphuric Acid Solution by carefully mixing 30 c.c. of pure concentrated Sulphuric Acid of the *U.S.P.* official strength (see p. 80) with sufficient Distilled Water to produce about 1050 c.c., and sets a measured quantity of this strong solution by titration with

Normal Volumetric Potassium Hydroxide Solution, using 2 drops of Methyl Orange Solution as an indicator of neutrality. Having ascertained the number of c.c. required it proceeds to dilute the strong solution in the proportion of the volume actually required to the proportion which should have been required were the solution of strictly normal strength. As an additional safeguard against error it directs that a second determination of the strength should be made to ensure the exact correspondence of the solution, and if it be still found that solutions differ a new adjustment is directed to be made.

P.G.—Not included. See Table.

DECI-NORMAL VOLUMETRIC SULPHURIC ACID SOLUTION.

This solution may be prepared from the Normal Solution by diluting a measured quantity of the stronger solution with sufficient Distilled Water to produce ten times the volume of liquid. Thus 100 c.c. of Volumetric Sulphuric Acid Solution may be diluted with sufficient Distilled Water to produce 1000 c.c. of Deci-normal Volumetric Sulphuric Acid Solution. It should be carefully set against pure dry Sodium Carbonate in the same manner as described under Volumetric Sulphuric Acid, except that the weight of substance there indicated may be dissolved in Distilled Water and diluted with a further sufficient quantity of Distilled Water to produce 200 c.c., 10 c.c. of this solution may be employed and should correspond exactly to 10 c.c. of Deci-normal Volumetric Sulphuric Acid Solution. In the event of the solutions not strictly corresponding, the number of c.c. should be noted and the solution diluted accordingly, and should be again reset with a further 10 c.c. of the pure dry Sodium Carbonate Solution.

B.P.—The *B.P.* prepares the Deci-normal Solution from the Volumetric Sulphuric Acid Solution in a similar manner to that described above, but does not mention the necessity of setting the finished product.

U.S.P.—The Tenth-normal Volumetric Sulphuric Acid of the *U.S.P.* is prepared by diluting 100 c.c. of Normal Volumetric Sulphuric Acid Solution with sufficient Water to measure 1000 c.c. at 25° C. (77° F.). As will be seen from the monographs on the standardised preparations, *e.g.*, Belladonna, Ipecacuanha, Nux Vomica, etc., this solution is most frequently employed together with Fiftieth-normal Volumetric Potassium Hydroxide Solution (*U.S.P.*) in the titration of alkaloids, and in the various instances different indicators of neutrality are used, *e.g.*, Hæmatoxylin Solution, Cochineal and Iodeosin Solution. The *U.S.P.* authorities have consequently inserted a requirement to the effect that a special experiment should be made, in order to ensure the correspondence of these two solutions towards these indicators of neutrality. In the event of the solutions not corresponding they should be so adjusted that they do exactly correspond.

P.G.—Not included. See Table.

HALF-NORMAL VOLUMETRIC SULPHURIC ACID SOLUTION.

Half-normal Volumetric Sulphuric Acid Solution may be prepared by diluting a measured volume of Normal Volumetric Sulphuric Acid Solution with sufficient Distilled Water to produce 2 volumes, that is to say 500 c.c. of the stronger solution may be diluted with sufficient Distilled Water to produce 1000 c.c. of the weaker solution, and may be set against a solution prepared by dissolving 2·6327 grammes of pure dry Sodium Carbonate in Distilled Water and adding a further sufficient quantity of Distilled Water to produce 100 c.c. 10 c.c. of the Semi-normal Volumetric Sulphuric Acid should be equivalent to 10 c.c. of the Sodium Carbonate Solution, Methyl Orange Solution being employed as an indicator of neutrality. If the solutions do not correspond, the number of c.c. required should be accurately noted and the corresponding adjustment made; they may then be again re-titrated to ensure strict correspondence.

B.P.—Not included. See Table.

U.S.P.—The Half-normal Volumetric Sulphuric Acid Solution of the *U.S.P.* is prepared on lines similar to those indicated above. The measurements are made at 25° C. (77° F.). The solution is chiefly used for the titration of the organic salts of Potassium and Sodium, and for this purpose Methyl Orange Solution is usually employed as an indicator of neutrality. The

U.S.P. directs that a measured quantity of 10 c.c. of Normal Volumetric Potassium Hydroxide Solution should be titrated with the above solution, using 2 drops of Methyl Orange T.S. as an indicator of neutrality; exactly 20 c.c. of the Half-normal Solution should be required. In the event of a divergence between the above solutions, an adjustment should be made in order to ensure their exact correspondence.

P.G.—Not included. See Table.

FIFTIETH-NORMAL VOLUMETRIC SULPHURIC ACID SOLUTION.

This solution may be prepared by diluting 1 volume of Volumetric Sulphuric Acid Solution with sufficient Distilled Water to produce 50 volumes, or 1 volume of Deci-normal Volumetric Sulphuric Acid Solution with sufficient Distilled Water to produce 5 volumes. Thus 20 c.c. of Volumetric Sulphuric Acid Solution may be diluted with sufficient Distilled Water to produce 1000 c.c., or 200 c.c. of Deci-normal Volumetric Acid Solution may be diluted with sufficient Distilled Water to produce 1000 c.c. It may be set against a solution of pure dry Sodium Carbonate prepared by dissolving a weighed quantity of 0·10531 gramme of pure dry Sodium Carbonate in Distilled Water, and adding a further sufficient quantity of Distilled Water to produce 100 c.c. 50 c.c. of this solution exactly corresponds to 50 c.c. of the Fiftieth-normal Solution, Methyl Orange Solution may be used as an indicator of neutrality.

B.P.—Not included. See Table.

U.S.P.—The *U.S.P.* Fiftieth-normal Volumetric Sulphuric Acid Solution is prepared on similar lines to those above indicated, except that the measurements are made at a temperature of 25° C. (77° F.). It is chiefly employed for alkaloidal titration, and for this purpose Hæmatoxylin, Cochineal or Iodeosin T.S. are generally employed as indicators of neutrality. The *U.S.P.* does not in this instance require that a special test should be made to ensure correspondence between the solutions with which these indicators are used.

VOLUMETRIC SODIUM HYDROXIDE SOLUTION.

A solution of Sodium Hydroxide containing in each 1000 c.c. 39·76 grammes of pure Sodium Hydroxide (NaHO, eq. 39·76). The solutions should be kept in well-closed glass bottles, fitted with a vaselined stopper, an indiarubber stopper, or, preferably, fitted with a tube containing Soda-lime, or it may be kept under a layer of pure liquid Paraffin.

A convenient method for preparing Volumetric Sodium Hydroxide Solution is to first prepare a concentrated Sodium Hydroxide Solution by dissolving 50 grammes of good stick or good powdered Sodium Hydroxide in 50 c.c. of Distilled Water, the resulting solution is kept under a layer of pure liquid Paraffin. 1 gramme of this concentrated solution is carefully weighed and diluted with about 10 c.c. of Water, a few drops of Phenolphthalein Solution added and the liquid titrated with Volumetric Sulphuric Acid Solution, using Phenolphthalein Solution as an indicator of neutrality. The number of c.c. of Volumetric Sulphuric Acid Solution required is noted, and the amount of pure Sodium Hydroxide corresponding to this number of c.c. is ascertained by multiplying by 0·03976; having ascertained the percentage of Volumetric Sodium Hydroxide present in each gramme a sufficient weight of the solution is removed to represent about 41 or 42 grammes of pure Sodium Hydroxide, and this quantity is mixed with sufficient Distilled Water to produce 1000 c.c.; this will give a solution somewhat greater in strength than the Normal. This solution is set against 20 c.c. of Volumetric Sulphuric Acid Solution prepared as described under that heading, Phenolphthalein Solution being used as an indicator, and the number of c.c. required noted. The balance of the liquid in the burette is returned to the vessel holding the main quantity of liquid. Its volume is carefully ascertained, and is then diluted in the proportion of this number of c.c. to 20 (the number of c.c. which should have been required had the solution been strictly normal); thus, as an example, if x represents the number of c.c. required to neutralise the 20 c.c. of Volumetric Sulphuric Acid Solution and 950 c.c. of liquid are available, it should be diluted in the proportion of x is to 20 so is 950. After this dilution has been made the finished product should be checked against Volumetric Sulphuric Acid Solution, and if it be found that the solution should still not correspond a further adjustment of the solution is necessary until they are in exact agreement. It may be noted that the *B.P.* employs Litmus and not Phenolphthalein Solution as an indicator of neutrality. It is generally conceded that Phenolphthalein is the more sensitive indicator.

B.P.—The *B.P.* Volumetric Sodium Hydroxide Solution is prepared by dissolving 42 grammes of purified Sodium Hydroxide in 1000 c.c. of Distilled Water. It is set by titration against Volumetric Sulphuric Acid Solution, the excessively large quantity of 100 c.c. being employed for the titration, and Litmus is used as an indicator of neutrality. The number of c.c. of the strong solution required to neutralise this quantity is noted, and the solution diluted in the ratio between this number of c.c. and 100. The *B.P.* makes no requirement that the solution should again be checked after the adjustment has been made, and apparently assumes that the solution is correct.

U.S.P.—Normal Volumetric Sodium Hydroxide Solution (*U.S.P.*) is prepared by dissolving 54 grammes of Sodium Hydroxide (*U.S.P.*) in sufficient Distilled Water to measure 1050 c.c. The solution is standardised by titration against Potassium Bitartrate Solution. The Potassium Bitartrate used is a specially purified Bitartrate obtained from Potassii Bitartras (*U.S.P.*), the following process being adopted. A weighed quantity of 100 grammes of the salt is digested in a covered beaker on a water-bath with a mixture of 85 c.c. of Distilled Water and 25 c.c. of diluted Hydrochloric Acid, the digestion being carried on with intervals of occasional stirring for 3 hours, the mixture is quickly cooled, the solution drained from the precipitate, which is washed by decantation with two successive quantities each of 100 c.c. of Water, the precipitate is collected upon a plain filter, the washing with cold Water is continued until a few drops of the filtrate, when acidified with Nitric Acid, afford no opalescence on the addition of Silver Nitrate T.S. The purified Bitartrate is dissolved in the smallest possible quantity of boiling Water, filtered, and the filtrate constantly stirred whilst being repeatedly cooled. The crystalline precipitate is removed by filtration, when cold washed with 300 c.c. of cold Water and allowed to drain thoroughly. It it then dried until constant in weight at 120° C. (248° F.). It should be kept in dry, well-stoppered glass bottles. A weighed quantity of 9·339 grammes of this salt and 160 c.c. of Distilled Water are introduced into a glass flask, the liquid boiled until solution has taken place and the strong Potassium Hydroxide Solution is added, a few drops (3 to 5) of Phenolphthalein Solution being added as an indicator of neutrality. The number of c.c. of Potassium Hydroxide Solution is noted, and, assuming that this number of c.c. is represented by x, the solution is diluted in the proportion of x to 50. The *U.S.P.* requires that, subsequent to adjustment, the solution should be reset against the solution of a similar quantity of a purified Potassium Bitartrate in a similar manner to that described above, and if still found to be in want of agreement, that a fresh adjustment should be made and the solutions made to strictly correspond. A special precaution is inserted with regard to the liability of solutions of Potassium or Sodium Hydroxide to absorb Carbonic Anhydride from the air, and it is required that these Volumetric Solutions should be preserved in bottles provided with well-fitting rubber stoppers, or with tubes filled with Soda-lime, which latter provision is also to be observed if the solution is allowed to remain for any considerable time in a burette. The use of Volumetric Sodium Hydroxide in place of Volumetric Potassium Hydroxide is permitted, but as the latter solution is stated to foam less and to attack glass more slowly it has a preference over the former.

P.G.—Not included. See Table.

DECI-NORMAL VOLUMETRIC SODIUM HYDROXIDE SOLUTION.

The Deci-normal Solution may be prepared by diluting 1 volume of Normal Solution with sufficient Distilled Water to produce 10 volumes, that is to say, 100 c.c. of Normal Volumetric Sodium Hydroxide Solution is diluted with sufficient Distilled Water to produce 1000 c.c. The finished solution should be set against a Tenth-normal Volumetric Sulphuric Acid Solution prepared as described under that heading, and the solutions adjusted to correspond, Phenophthalein Solution may be used as an indicator of neutrality.

The solution should be kept in well-closed glass bottles, preferably fitted with a tube containing Soda-lime, or it may be kept under a layer of pure liquid Paraffin.

B.P.—The *B.P.* Deci-normal Volumetric Solution is prepared in a similar manner to the solution described above, but no reference is made to a method of ensuring the accuracy of the finished product, nor is any reference made to precautions to be observed for storage.

U.S.P.
P.G. } Not included. See Table.

DOUBLE NORMAL VOLUMETRIC SODIUM HYDROXIDE SOLUTION.

A solution containing in each 1000 c.c., 79·52 grammes of pure Sodium Hydroxide (NaHO).

B.P.
P.G. } Not included. See Table.

U.S.P.—The *U.S.P.* prepares this solution by dissolving 90 grammes of Sodium Hydroxide (*U.S.P.*) in sufficient Distilled Water to produce about 1000 c.c. The solution is finally set against purified Potassium Bitartrate in a similar manner to that described under Normal Volumetric Sodium Hydroxide Solution (*U.S.P.*), and is adjusted so that a measured quantity of 25 c.c. exactly neutralises the quantity of Potassium Bitartrate there mentioned. It is equally important that the same precaution should be observed for keeping this solution, as in the case of the Normal Volumetric Sodium Hydroxide Solution.

NORMAL ALCOHOLIC SODIUM HYDROXIDE SOLUTION.

A solution containing 39·76 grammes of pure Sodium Hydroxide (NaHO) in each 1000 c.c. It is prepared on similar lines to the Volumetric Sodium Hydroxide Solution, except that Alcohol (90 p.c.) is used in the place of Distilled Water and set against Normal Volumetric Hydrochloric Acid Solution, to be hereafter described, Phenolphthalein Solution being used as an indicator of neutrality. It may be adjusted on the same lines as the solution referred to, so that the solutions may be strictly in agreement, or, preferably, a factor may be calculated, by which the number of c.c. used during a titration may be at once converted into terms of strictly Normal Solution.

It should be kept in glass bottles provided with well-fitting rubber stoppers.

B.P.—The *B.P.* information respecting Normal Volumetric Alcoholic Sodium Hydroxide Solution is very meagre. It appears as a footnote to Volumetric Sodium Hydroxide Solution, and officially directs the use of Alcohol (90 p.c.) as a solvent. It may also be presumed that the solution is intended to be standardised in a similar manner to the aqueous solution, but no definite statement to this effect appears. No precautions to be observed for storing the solution are given.

U.S.P.
P.G. } Not included. See Table.

DECI-NORMAL VOLUMETRIC ALCOHOLIC SODIUM HYDROXIDE SOLUTION.

A solution containing 3·976 grammes of pure Sodium Hydroxide (NaHO) in each 1000 c.c. It may be prepared by diluting 1 volume of Normal Volumetric Alcoholic Sodium Hydroxide Solution with sufficient Alcohol (90 p.c.) to produce 10 volumes. It may be standardised against Deci-normal Volumetric Hydrochloric Acid Solution (to be hereafter described), and the solution may be either adjusted to a strictly Deci-normal strength, or a factor may be obtained from which the number of c.c. used during the titration may be converted into strictly Deci-normal strength. This factor is obtained by dividing the number of c.c. which should have been required to neutralise, by the number of c.c. actually required. The solution should be preserved in glass bottles fitted with well-fitting stoppers, or, preferably, with a rubber stopper containing a tube filled with Soda-lime.

B.P.—The *B.P.* solution is prepared, presumably, in a similar manner to the Tenth-normal Volumetric Sodium Hydroxide Solution, with the exception that Alcohol (90 p.c.) is used as a diluent in place of Water. No definite directions are given for the standardisation of the finished solution, nor are any precautions directed to be observed in the storage of the solution. The quantity of solution prepared on each occasion should be only sufficient to last for a short period.

U.S.P.
P.G. } Not included. See Table.

NORMAL VOLUMETRIC POTASSIUM HYDROXIDE SOLUTION.

A solution containing 55·71 grammes of pure Potassium Hydroxide (KOH) in each 1000 c.c. It may be prepared by dissolving 100 grammes of good commercial Potassium Hydroxide in sticks in 100 c.c. of Distilled Water. The resulting solution is cooled and kept under a layer of pure liquid Paraffin. A quantity of 1 gramme is weighed out in a weighing bottle, diluted with Distilled Water, and the quantity of Potassium Hydroxide present determined by titration with Volumetric Sulphuric Acid Solution, using a few drops of Phenolphthalein Solution as an indicator of neutrality. Having ascertained the quantity present in 1 gramme, a sufficient quantity is weighed out to yield about 58 grammes, and diluted with sufficient Distilled Water to produce 1000 c.c. The solution is standardised by titration with Volumetric Sulphuric Acid Solution, and adjusted to its requisite strength in a similar manner to the method adopted for Volumetric Sodium Hydroxide Solution. The same precautions are necessary with regard to the storage of the solutions when made.

B.P.—Not included. See Table.

It is presumed that the *B.P.* does not intend to include Volumetric Potassium Hydroxide Solution, unless the small type note under alcoholic solutions is intended to refer to both the aqueous and alcoholic solutions, which is scarcely likely. The note accords permission to use an equivalent proportion of Potassium Hydroxide in some instances instead of Sodium Hydroxide.

U.S.P.—The *U.S.P.* Normal Volumetric Solution is required to contain 55·74 grammes of pure Potassium Hydroxide (KOH) in 1000 c.c. at 25° C. (77° F.), and is prepared by dissolving 75 grammes of Potassium Hydroxide (*U.S.P.*) in sufficient Water to measure about 1050 c.c. It is standardised by methods similar to that described in the *U.S.P.* process for setting Normal Volumetric Sodium Hydroxide Solution. The *U.S.P.* requires that the strength of the finished solution shall be freshly determined after adjustment has been made, and that if required a readjustment shall be instituted in order that there may be strict correspondence between the solutions. It directs similar precautions to those mentioned under Sodium Hydroxide Solution to be observed in storage.

P.G.—The Normal Volumetric Potassium Hydroxide Solution of the *P.G.* is required to contain 56·16 grammes of Potassium Hydroxide in 1 litre. No method is given for its preparation or standardisation, nor are precautions for its storage stated.

DECI-NORMAL VOLUMETRIC POTASSIUM HYDROXIDE SOLUTION.

A solution containing 5·571 grammes of Potassium Hydroxide (KOH) in 1000 c.c. It is prepared by diluting 1 volume of Normal Volumetric Potassium Hydroxide Solution with sufficient Distilled Water to produce 10 volumes; *e.g.*, 100 c.c. of Normal Volumetric Potassium Hydroxide Solution is diluted with sufficient Distilled Water to produce 1000 c.c. It may be standardised against Deci-normal Volumetric Sulphuric Acid Solution, and in the event of its being found not to correspond should be readjusted till the solutions are in strict accordance.

It should be kept in glass bottles fitted with well-fitting rubber corks, preferably fitted with a Calcium Chloride tube containing fragments of Soda-lime, or it may be kept under the surface of a layer of pure liquid Paraffin.

B.P.—Not included. See Table; see also note under *B.P.* Volumetric Potassium Hydroxide Solution.

U.S.P.—The *U.S.P.* solution is prepared on similar lines to that given above, with the exception that the Normal Potassium Hydroxide Solution (*U.S.P.*) is required to be freshly standardised, and the measurements are made at 25° C. (77° F.). The solution is set against purified Potassium Bitartrate. A weighed quantity of 0·9339 gramme should require for neutralisation 50 c.c. of the

Tenth-normal Volumetric Potassium Hydroxide Solution. The *U.S.P.* requires the same precautions to be taken in the preservation of this solution as are recommended under Normal Volumetric Potassium Hydroxide Solution.

P.G.—The *P.G.* solution is required to contain 5·616 grammes of Potassium Hydroxide in 1 litre, and is prepared by mixing 10 c.c. of Normal Volumetric Potassium Hydroxide Solution (*P.G.*) and 90 c.c. of Water. It is standardised by titration against Deci-normal Volumetric Hydrochloric Acid Solution. No precautions are stated for its preservation.

FIFTIETH-NORMAL VOLUMETRIC POTASSIUM HYDROXIDE SOLUTION.

A solution containing 1·1142 grammes of Potassium Hydroxide (KOH) in 1000 c.c. prepared by diluting 1 volume of the Normal Solution, or 10 volumes of the Deci-normal Solution with sufficient Distilled Water to produce 50 volumes, *e.g.*, 20 c.c. of the Normal or 200 c.c. of the Deci-normal Solution is diluted with sufficient Distilled Water to produce 1000 c.c. It should be standardised against the Fiftieth-normal Volumetric Sulphuric Acid Solution described on p. 1296, and in the event of its being found incorrect the solution should be readjusted until the solutions are in strict accord. The same precautions which are observed in dealing with the Normal Solution should be also observed here.

U.S.P.—A solution containing 1·1148 grammes of Potassium Hydroxide (KOH) in 1000 c.c. prepared in a similar manner to the above, measurements being made at 25° C. (77° F.). The *U.S.P.* does not in this instance require that the solution should be standardised after preparation in order to ensure its correctness, although it states that it is for use together with Tenth-normal Volumetric Sulphuric Acid Solution in such delicate determinations as the titration of alkaloidal residues with Hæmatoxylin, Cochineal or Iodeosin T.S. as indicators of neutrality. It inserts cautions respecting its preservation which are virtually those given under the Normal Solution, with the addition of a recommendation that the solution should be renewed at frequent intervals.

P.G.—Not included. See Table.

HUNDREDTH-NORMAL VOLUMETRIC POTASSIUM HYDROXIDE SOLUTION.

A solution containing 0·5571 gramme of Potassium Hydroxide (KOH) in 1000 c.c., prepared by diluting 1 volume of the Normal Solution or 10 volumes of Deci-normal Solution with sufficient Distilled Water to produce 100 volumes. It should be standardised against Hundredth-normal Volumetric Sulphuric Acid Solution, prepared by diluting the Fiftieth-normal Solution with an equal volume of Distilled Water, the solution being in turn standardised against pure dry Sodium Carbonate.

B.P.—Not included. See Table.

A **Centi-normal Volumetric Sodium Hydroxide Solution** is officially described under Extractum Belladonnæ Liquidum, but is not included in the list of official Volumetric Solutions. It is stated to contain 0·3976 gramme of Sodium Hydroxide per litre. No method of preparation, standardisation, or preservation is given.

U.S.P.—A solution containing 0·5574 gramme of Potassium Hydroxide in 1000 c.c., prepared by diluting 10 c.c. of the Normal or 100 c.c. of the Tenth-normal Solution with sufficient Water to measure 1000 c.c. The measurements are made at 25° C. (77° F.). The usual notice respecting the precautions to be observed for the preservation of the solution is here omitted, but the solution is recommended to be frequently renewed.

P.G.—The *P.G.* solution contains 0·5616 gramme of Potassium Hydroxide in 1 litre, and is prepared by mixing 10 c.c. of the Tenth-normal Solution with 90 c.c. of Water. It is stardardised against Hundredth-normal Volumetric Hydrochloric Acid Solution, to be hereafter described.

NORMAL VOLUMETRIC ALCOHOLIC POTASSIUM HYDROXIDE SOLUTION.

Normal Volumetric Alcoholic Potassium Hydroxide Solution is rarely if ever employed, and is not official in either the *U.S.P.* or the *P.G.* The *B.P.* description of it is brief.

It is a solution containing 55·71 grammes of Potassium Hydroxide in 1000 c.c. of Alcohol (90 p.c.). The *B.P.* permits its use in 'certain' cases instead of Alcoholic Sodium Hydroxide, but does not state what these certain cases are.

SEMI-NORMAL VOLUMETRIC ALCOHOLIC POTASSIUM HYDROXIDE SOLUTION.

A solution containing 27·855 grammes of Potassium Hydroxide (KOH) in Alcohol (90 p.c.). It may be conveniently prepared in the following manner: A weighed quantity of good commercial Potassium Hydroxide in sticks is dissolved in about 20 c.c. of Water and titrated with Normal Volumetric Sulphuric Acid Solution, using Phenolphthalein Solution as an indicator. From the results of this titration the percentage of pure Potassium Hydroxide in the sample is calculated, and a sufficient quantity taken to ensure a slight excess over the calculated weight; thus, assuming the sample to have indicated 85 p.c. of the pure Hydroxide, the quantity required for the solution should be as 85 : 100 : : 27·855, corresponding to about 33 grammes. Weigh out about 35 grammes of the specimen, dissolve in 20 c.c. of Water and dilute with sufficient Alcohol (90 p.c.) to produce 1000 c.c. The solution may be standardised against Semi-normal Volumetric Hydrochloric Acid Solution, using Phenolphthalein Solution as an indicator of neutrality. A measured quantity of 50 c.c. of the Semi-normal Volumetric Hydrochloric Acid Solution may be taken and the number of c.c. required to neutralise it carefully noted. The solution may then be diluted with Alcohol (90 p.c.) in the proportion between the number of c.c. actually required, to the number of c.c. which should have been required had the solution been strictly Semi-normal. In the event of the solution being only of little more than Semi-normal strength a good plan is to obtain a factor by which it may be converted into terms of strictly Semi-normal Solution, and to allow the extra strength for deterioration on keeping. The solution will be required to be set freshly at each time of using if employed at more than short intervals.

The same precautions which are observed with the Normal Volumetric Potassium Hydroxide Solution should be observed in the case of this solution, and in addition the glass bottles should be of a dark amber tint.

B.P.—Not included. See Table.

U.S.P.—A solution containing 27·87 grammes of Potassium Hydroxide in 1000 c.c. prepared by dissolving about 40 grammes of Potassium Hydroxide (*U.S.P.*) in about 20 c.c. of Water, and adding sufficient Alcohol (94·9 p.c.) to produce 1000 c.c. One day is allowed to elapse for the solution to clear, and the supernatant solution is quickly decanted into another bottle. The solution is standardised against a purified Potassium Bitartrate, using Phenolphthalein T.S. (5 drops) as an indicator of neutrality. A weighed quantity of 1·8678 grammes of the purified Bitartrate representing 20 c.c. of a Semi-normal Solution is employed. The number of c.c. required to exactly neutralise is noted and the solution diluted with Alcohol (94·9 p.c.) in the proportion between this number of c.c. and 20. 20 c.c. of the finished solution being required to exactly neutralise 1·8678 grammes of purified Potassium Bitartrate. An alternative method of standardising the solution is with Half-normal Volumetric Hydrochloric Acid Solution, the dilution being made in a similar manner; the finished solution being required to exactly neutralise an equal volume of the Half-normal Volumetric Hydrochloric Acid, the measurements are made at 25° C. (77° F.). The *U.S.P.* inserts precautions respecting the preservation of the solution, and requires that it should be kept in bottles provided with well-fitting rubber stoppers, and that it should be protected from the light. The solution decreases in strength somewhat rapidly, and it is required in addition that blank tests should be performed whenever it is employed in titration.

P.G.—A solution containing 28·8 grammes of Potassium Hydroxide in 1 litre of Alcohol (90 p.c.). No method of preparation is given. It is standardised against Semi-normal Volumetric Sulphuric Acid Solution. The *P.G.* describes it as a colourless or but slightly yellow-coloured liquid. No precautions respecting its preservation are included.

DECI-NORMAL VOLUMETRIC ALCOHOLIC POTASSIUM HYDROXIDE SOLUTION.

A Deci-normal Alcoholic Solution of Potassium Hydroxide is seldom if ever employed in official volumetric work. Neither the *U.S.P.* nor the *P.G.* includes such a solution. The *B.P.* in the vaguest possible terms as a footnote to Volumetric Sodium Hydroxide Solution. From this description it may be taken to mean a solution containing 5·571 grammes of Potassium Hydroxide in 1000 c.c. of Alcohol (90 p.c.) which is for use in 'certain cases' instead of Sodium Hydroxide Solution.

NORMAL VOLUMETRIC HYDROCHLORIC ACID SOLUTION.

A solution containing 36·19 grammes of Hydrogen Chloride (HCl) in 1000 c.c. It may be prepared by a method similar to that described under Volumetric Sulphuric Acid Solution, except that Hydrochloric Acid is substituted for Sulphuric Acid; it may be set against pure dry Sodium Carbonate as there described.

B.P.—Not included. See Table.

U.S.P.—A solution containing 36·18 grammes of absolute Hydrochloric Acid in 1000 c.c. It is prepared by mixing 130 c.c. of Hydrochloric Acid [sp. gr. 1·158 at 25° C. (77° F.)] with sufficient Water to measure 1000 c.c., the measurements being made at 25° C. (77° F.). It is standardised with Normal Volumetric Potassium Hydroxide Solution, using Methyl Orange T.S. as an indicator of neutrality. The number of c.c. of Normal Volumetric Potassium Hydroxide Solution required to neutralise 10 c.c. of the above solution mixed with about 20 c.c. of Water is noted and the acid solution diluted so that the solutions are in strict accord. After the dilution has been made the *U.S.P.* directs that a further trial of its neutralising power should be made, and if still found to be incorrect it should be readjusted.

P.G.—A solution containing 36·46 grammes of absolute Hydrochloric Acid in 1 litre. No directions are given for its preparation or standardisation.

SEMI-NORMAL VOLUMETRIC HYDROCHLORIC ACID SOLUTION.

A solution containing 18·095 grammes of Hydrogen Chloride in 1000 c.c. prepared by mixing 1 volume of the Normal Solution with sufficient Distilled Water to produce 2 volumes, *e.g.*, 500 c.c. of the Normal Solution is diluted with sufficient Distilled Water to produce 1000 c.c. It may be standardised by titration against Normal Volumetric Sodium Hydroxide Solution, of which 10 c.c. should exactly neutralise 20 c.c. of the Semi-normal Acid. In the event of its not being so, it should be readjusted and a fresh titration should be made in order to ensure the solutions being strictly in accord.

B.P.—Not included. See Table.

U.S.P.—A solution containing 18·09 grammes of absolute Hydrochloric Acid in 1000 c.c. prepared by diluting 500 c.c. of Normal Volumetric Hydrochloric Acid Solution with sufficient Distilled Water to measure exactly 1000 c.c., the measurements are made at 25° C. (77° F.). No directions are given to ensure the finished solution being of the correct strength.

P.G.—A solution containing 18·23 grammes of absolute Hydrochloric Acid in 1 litre. No method of preparation or standardisation given.

DECI-NORMAL VOLUMETRIC HYDROCHLORIC ACID SOLUTION.

A solution containing 3·619 grammes of Hydrogen Chloride in 1000 c.c. prepared by diluting 1 volume of the Normal Solution with sufficient Distilled Water to produce 10 volumes, *e.g.*, 100 c.c. of the Normal Solution is diluted with sufficient Distilled Water to produce 1000 c.c. It may be standardised against Deci-normal Volumetric Sodium Hydroxide Solution, using Phenolphthalein Solution as an indicator of neutrality. In event of the solutions not strictly corresponding, a readjustment should be made in order that they may be in strict accord.

B.P.—Not included. See Table.

Although not included in the official list of Volumetric Solutions it is used in the titration of the residual alkaloid from the assay of Liquid Extract of Belladonna and is described under Extractum Belladonnæ Liquidum, as containing 3·619 grammes of HCl per litre. No method of preparation, standardisation, or preservation is given.

U.S.P.—Not included. See Table.

P.G.—A solution containing 3·6464 grammes of absolute Hydrochloric Acid in 1 litre prepared by mixing 10 c.c. of the Normal Solution and 90 c.c. of Water. No directions for its standardisation are included.

CENTI-NORMAL VOLUMETRIC HYDROCHLORIC ACID SOLUTION.

A solution containing 0·3619 gramme of Hydrogen Chloride in 1000 c.c. prepared by diluting 1 volume of Normal or 10 volumes of Deci-normal Solution with sufficient Distilled Water to produce 100 volumes, *e.g.*, 10 c.c. of Normal or 100 c.c. of Tenth-normal Solution is diluted with sufficient Distilled Water to produce 1000 c.c. The solution is standardised with Centi-normal Volumetric Potassium Hydroxide Solution, and in the event of the solutions not strictly corresponding, a readjustment should be made, so that they may be in strict accord. The solution requires to be carefully standardised as it is used in alkaloidal titrations.

B.P.
U.S.P.} Not included. See Table.

P.G.—A solution containing 0·3646 gramme of absolute Hydrochloric Acid in 1 litre. It is directed to be prepared by mixing 10 c.c. of Tenth-normal Volumetric Hydrochloric Acid Solution and 90 c.c. of Water.

DECI-NORMAL VOLUMETRIC IODINE SOLUTION.

A solution containing 12·59 grammes of pure Iodine prepared by the resublimation of Iodine answering the official tests, mixed with 25 p.c. of its weight of dry Potassium Iodide; the resulting crystals being freed from moisture by drying over fused Calcium Chloride or over Sulphuric Acid in a desiccator. A weighed quantity of 12·7 grammes is mixed with 18 grammes of pure Potassium Iodide (free from Iodate) and dissolved in about 25 c.c. of Water. When completely dissolved the solution is diluted by the cautious addition of Water to measure 1000 c.c. It is standardised against Deci-normal Volumetric Sodium Thiosulphate Solution (to be hereafter described), using, if necessary, Starch Mucilage as an indicator. The solution may also be standardised by titration with pure Arsenious Anhydride. The number of c.c. of the Iodine Solution required to completely react with the Deci-normal Volumetric Sodium Thiosulphate Solution employed is noted, and the solution diluted accordingly (as described under Volumetric Sulphuric Acid Solution), so that it shall be strictly Deci-normal, or a factor may be obtained by dividing the number of c.c. which should have been required, by the number of c.c. actually required, and this factor used to interpret the solution into strictly Deci-normal terms.

It should be kept in well-stoppered glass bottles of a dark amber tint in a cool atmosphere and protected as far as possible from the light.

B.P.—A solution containing 12·59 grammes of pure Iodine and 18 grammes of pure Potassium Iodide in 1000 c.c. The official method of setting the solution is by titration against Arsenious Anhydride, pure Barium Thiosulphate, or other suitable substance, and it is permitted to either use the solution as it is with a correction for difference in strength between it and Deci-normal, or to convert it into a strictly Deci-normal Solution. The *B.P.* gives no instructions regarding the preservation of the solution.

U.S.P.—A solution containing 12·59 grammes of pure Iodine in 1000 c.c. of Water. It may be prepared by two methods:—1. By dissolving 12·59 grammes of pure Iodine and 18 grammes of pure Potassium Iodide in 300 c.c. of Water and diluting with sufficient Water to measure exactly 1000 c.c. The measurements are made at 25° C. (77° F.). The pure Iodine is prepared from Iodine (*U.S.P.*) by careful re-sublimation, first over boiling Water to remove moisture, Cyanogen Iodide, Bromide and Chloride, and then by mixing it with 5 p.c. of its weight of dry Potassium Iodide and re-sublimation on a sand-bath; any moisture still adhering is removed by drying over Calcium Chloride. A determination of the strength of this solution is made at the time of using, unless it is freshly prepared. 2. A weighed quantity of 14 grammes of Iodine (*U.S.P.*) and 18 grammes of Potassium Iodide (*U.S.P.*) are dissolved in about 300 c.c. of Water and the solution diluted to 1000 c.c. The resulting solution is standardised by titration with 10 c.c. of Tenth-normal Volumetric Sodium Thiosulphate Solution, the number of c.c. recorded, the ascertained volume of the solution diluted in the ratio of the number of c.c. actually required to the number of c.c. which should have been required (namely 10). After dilution the strength is again verified to ensure strict accordance between the solutions, and in the event of their still differing a fresh adjustment is made followed by re-determination in order to ensure the solutions being strictly correct.

The solution is directed to be kept in glass-stoppered bottles, but no other precaution specified.

P.G.—A solution containing 12·685 grammes of Iodine and 20 grammes of Potassium Iodide in 1 litre. The Iodine is directed to be dissolved by the aid of 20 grammes of Potassium Iodide, but otherwise no instructions are given respecting the preparation or standardisation of the solution; no directions are inserted regarding the preservation of the solution when made.

DECI-NORMAL VOLUMETRIC BROMINE SOLUTION.

B.P. } Not included. See Table.
P.G. }

The solution is only employed in the determination of Phenol.

U.S.P.—A solution containing 7·936 grammes of pure Bromine in 1000 c.c. It is prepared by dissolving 3·2 grammes of Potassium Bromate and 50 grammes of Potassium Bromide in sufficient Water to measure 900 c.c. The solution is standardised by means of Potassium Iodide Solution. A measured quantity of 20 c.c. of the above solution is transferred into a 250 c.c. glass-stoppered bottle mixed with 75 c.c. of Water, 5 c.c. of pure Hydrochloric Acid and 5 c.c. of Potassium Iodide T.S. The liberated Iodine is titrated with Tenth-normal Volumetric Sodium Thiosulphate Solution. The number of c.c. required is noted, and an ascertained volume of the solution diluted in the ratio of the number of c.c. of Tenth-normal Solution actually required to the number of c.c. of Tenth-normal Solution which should have been required. A re-determination of the strength of the solution is made, and in the event of the solutions still not agreeing it is readjusted so that the solutions shall be strictly in accord.

The solution is directed to be kept in well-stoppered bottles of a dark amber tint.

DECI-NORMAL VOLUMETRIC SODIUM THIOSULPHATE SOLUTION.

A solution containing 24·644 grammes of crystallised Sodium Thiosulphate ($Na_2S_2O_3$. $5H_2O$) in 1000 c.c. of Distilled Water. It may be prepared by dissolving about 30 grammes of the crystallised salt in about 250 c.c. of Distilled Water, and diluting with a further quantity of Distilled Water to measure 1000 c.c. It may be set against a weighed quantity of the re-sublimed Iodine described under Deci-normal Volumetric Iodine Solution, or, preferably, by means of Deci-normal Volumetric Potassium Bichromate Solution (hereafter described), and Potassium Iodide Solution. A measured quantity of 20 c.c. of Deci-normal Volumetric Potassium Bichromate Solution is introduced into a solution of 1 gramme of Potassium Iodide in 50 c.c. of Water, and 10 c.c. of diluted Sulphuric Acid added. The liberated Iodine is titrated with the above solution, the number of c.c. accurately noted, and an ascertained volume of the approximately Deci-normal Thiosulphate Solution diluted in the ratio between the number of c.c. actually required, and the number of c.c. which should have been required, namely 20. After dilution, the solution is reset in a similar way to that described above. In order to ensure accuracy, and if found not to be in agreement, it should be readjusted so that the solutions should be in strict accord.

It should be kept in well-stoppered glass bottles of a dark amber tint and in a cool atmosphere.

B.P.—A solution containing 24·644 grammes of crystallised Sodium Thiosulphate ($Na_2S_2O_3$. $5H_2O$) in 1000 c.c. of Distilled Water. It is officially directed to be prepared by dissolving 28 grammes of the salt in 1000 c.c. of Distilled Water, and to be set against Volumetric Iodine Solution, Mucilage of Starch being employed as an indicator. An excessively large quantity of Volumetric Iodine Solution is employed for titration, namely 100 c.c. The solution is diluted in accordance with the result of this determination, and adjusted to contain the above-mentioned amount of crystallised Sodium Thiosulphate. No directions are given with regard to the preservation of the solution.

U.S.P.—A solution containing 24·644 grammes of crystallised Sodium Thiosulphate in 1000 c.c. at 25° C. (77° F.). It is prepared by dissolving 30 grammes of the salt in sufficient Distilled Water to measure 1000 c.c. The Sodium Thiosulphate employed must be free from Sulphates and Sulphites, free alkalis and Calcium salts. The solution is standardised with Tenth-normal Volumetric Potassium Bichromate Solution and Potassium Iodide. The solution is diluted in accordance with the result obtained with this Volumetric determination, and a fresh determination is made to ensure the accuracy of the solution. In the event of the solutions being still found lacking in agreement a fresh adjustment is made in order to render them in strict accord.

The solution is required to be kept in glass-stoppered bottles carefully protected from dust.

P.G.—A solution containing 24·832 grammes of Sodium Thiosulphate in 1 litre of Water. No directions are given for its preparation, standardisation, or preservation.

DECI-NORMAL VOLUMETRIC SILVER NITRATE SOLUTION.

A solution containing 16·869 grammes of Silver Nitrate in 1000 c.c., prepared by dissolving this quantity of the salt in about 250 c.c. of Distilled Water, and diluting the solution with a further quantity of Distilled Water to measure 1000 c.c. It may be standardised with Deci-normal Volumetric Hydrochloric Acid Solution or with Deci-normal Volumetric Sodium Chloride Solution. A measured quantity of 10 c.c. of either solution may be employed. The number of c.c. required is accurately noted and an ascertained volume of the solution is diluted with Distilled Water in the ratio between the number of c.c. of Deci-normal Volumetric Silver Nitrate Solution actually required, and the number of c.c. which should have been required, namely 10. In order to ensure that the dilution is correct a re-determination of the strength of the solution should be made, and in the event of the solutions still not agreeing a further adjustment should be made so that the solutions may be in strict accord.

When finished the solution should be kept in well-stoppered glass bottles of a dark amber tint in a cool atmosphere and protected as far as possible from contact with dust and light.

B.P.—A solution containing 16·869 grammes of Silver Nitrate in 1000 c.c. of Water prepared by dissolving the salt in a sufficient quantity of Water and further diluting with Distilled Water to produce 1000 c.c. The strength of the solution is officially directed to be checked by titration against pure Sodium Chloride or pure Hydrochloric Acid Solution of definite strength, and the solution adjusted according to the result of this Volumetric determination or the real strength of the solution recorded in order that the requisite correction may be made. No directions are contained for the verification of the solution after dilution.

Opaque stoppered bottles are recommended for its preservation, but amber-tinted glass bottles are preferable.

U.S.P.—A solution containing 16·869 grammes of Silver Nitrate in 1000 c.c. of Water prepared by dissolving the pulverised and dried salt, completely dehydrated at 130° C. (266° F.), in sufficient Water to measure 1000 c.c. In this instance it appears to be assumed that the solution will be found correct when made, as no directions are given for its standardisation, although the various methods in which the solution may be employed for titration are recorded: thus, there is the method of direct titration where the Volumetric Solution is added direct to the solution of a weighed quantity of the salt with Potassium Chromate T.S. as an indicator; there is the Volhard method of indirect titration where an accurately measured excess of the Tenth-normal Volumetric Silver Nitrate Solution is added to the solution to be determined, acidified with Nitric Acid, and the uncombined excess of Tenth-normal Volumetric Silver Nitrate Solution is determined by titration with Tenth-normal Volumetric Potassium Sulphocyanate Solution, using Ferric Ammonium Sulphate T.S. as an indicator; and the method of titration generally employed for the assay of Hydrocyanic Acid and Cyanides where the formation of a permanent precipitate indicates the end of the reaction.

The solution is recommended to be kept in glass-stoppered vials of a dark amber colour, and to be carefully protected from dust and sunlight.

P.G.—A solution containing 16·977 grammes of Silver Nitrate in 1 litre. No directions are given for either its preparation, standardisation, or preservation.

VOLUMETRIC POTASSIUM BICHROMATE SOLUTION.

A solution containing 4·87 grammes of pure Potassium Bichromate ($K_2Cr_2O_7$, eq. 292·3) in 1000 c.c. of Water, that is to say a solution containing one-sixth of the molecular equivalent of the salt as 1 molecule of Potassium Bichromate liberates 3 atoms of Oxygen which are capable of oxidising 6 atoms of Hydrogen.

It may be prepared by dissolving the above-named quantity of the well-dried and finely powdered salt in about 250 c.c. of Distilled Water and diluting the solution with a further quantity of Distilled Water, sufficient to produce the above volume. It may be standardised against Deci-normal Volumetric Sodium Thiosulphate Solution, using Potassium Iodide Solution and Sulphuric Acid, or by titration with Deci-normal Volumetric Sodium Hydroxide Solution; in this latter case it must be recollected that the solution is Deci-normal, when the solution contains one-half its molecular equivalent per litre of Potassium Bichromate. It may also be set against pure Ferrous Ammonium Sulphate, in the latter case a solution containing one-sixth molecular equivalent per litre corresponds to the Deci-normal solution. If found too strong the solution may be diluted in a similar manner to other volumetric solutions, and re-standardised after dilution.

It should be kept in well-stoppered glass bottles of a dark amber colour and protected as far as possible from contact with dust and direct sunlight.

B.P.—A solution containing 4·87 grammes of Potassium Bichromate in 1000 c.c. It is prepared by dissolving this weight of the salt in about half the required volume of Water, and diluting the solution so obtained with a further quantity of Distilled Water to measure exactly 1000 c.c. It is officially directed to be standardised by titration with pure Ferrous Ammonium Sulphate, or 'other reliable substance,' and either dilution of the solution to a strictly Deci-normal strength or the ascertainment of its true strength is recommended.

U.S.P.—A solution containing 4·8713 grammes of pure Potassium Bichromate in 1000 c.c. of Distilled Water. It is prepared by dissolving the above-named quantity of pulverised salt dried at 120° C. (248° F.) in sufficient Water to measure exactly 1000 c.c. at 25° C. (77° F.). A method of standardising the solution is not given, but references are made to its uses, it is further pointed out that when used with Phenolphthalein as an indicator the solution is Tenth-normal when it contains 14·614 grammes in 1000 c.c., but when used as an oxidising agent a solution containing the amount stated at the commencement of the paragraph is the value of a Tenth-normal Solution. When employed for titrating various compounds it is added gradually from a burette to a solution of the Ferrous Salt in Water rendering it acid if necessary with Sulphuric Acid, Potassium Ferricyanide T.S. being used as an indicator, it is also employed in conjunction with Potassium Iodide and Sulphuric Acid in standardising Tenth-normal Sodium Thiosulphate Solution.

P.G.—Not included. See Table.

DECI-NORMAL VOLUMETRIC OXALIC ACID SOLUTION.

A solution containing 6·255 grammes of pure crystallised Oxalic Acid ($H_2C_2O_4H_2O$, eq. 125·10) in 1000 c.c. of Distilled Water. It may be prepared by dissolving 6·5 grammes of the crystallised salt in about 100 c.c. of Distilled Water and adding a further sufficient quantity of the Distilled Water to produce 1000 c.c. It may be standardised by titration against Deci-normal Volumetric Sodium Hydroxide Solution. A measured quantity of 20 c.c. of the latter solution is introduced into a porcelain basin, and the Oxalic Acid Solution run in from a burette, Phenolphthalein Solution being used as an indicator of neutrality.

The number of c.c. required is accurately noted, and an ascertained volume of the solution is then diluted in the ratio of the number of c.c. actually required to the number of c.c. which should have been required (20 c.c.). After dilution it is again standardised in order to ensure the correctness of the solution, and if found to be still lacking in agreement the solution should be further adjusted until it is in strict accord. It is employed in standardising Deci-normal Volumetric Potassium Permanganate Solution.

B.P.—Not included. See Table.

U.S.P.—A solution containing 6·255 grammes of pure crystallised Oxalic Acid in 1000 c.c. at 25° C. (77° F.). It may be prepared by dissolving 6·4 grammes of pure Oxalic Acid in sufficient Water to measure 1000 c.c. It is standardised by titration against 10 c.c. of a freshly-standardised Tenth-normal Volumetric Potassium Hydroxide Solution diluted with twice its volume of Water, Phenolphthalein T.S. being used as an indicator of neutrality, the titration being conducted at a boiling temperature. The solution is diluted in accordance with the usual instructions for the dilution of volumetric solutions. A fresh determination being made to ensure the accuracy of such dilution, and a readjustment being made should the solution be found to be still inexact, to render them in strict accord. The *U.S.P.* mentions that it deteriorates on standing. It is used for standardising Tenth-normal Volumetric Potassium Permanganate Solution.

P.G.—Not included. See Table.

DECI-NORMAL VOLUMETRIC POTASSIUM PERMANGANATE SOLUTION.

A solution containing 3·1374 grammes of pure crystallised Potassium Permanganate in 1000 c.c. It may be prepared by dissolving 3·5 grammes of the pure crystallised salt in about 250 c.c. of Distilled Water, and when solution is complete, diluting it with sufficient Distilled Water to measure 1000 c.c. It may be standardised by titration with Deci-normal Volumetric Oxalic Acid Solution, a measured quantity of 20 c.c. of the latter solution is introduced into a glass flask, mixed with about 1 c.c. of Sulphuric Acid, heated over a Bunsen flame, and the Permanganate Solution run in from a burette until a faint pink colour (permanent for about 30 seconds) is produced. The number of c.c. required is accurately noted, and an ascertained volume of the approximately Deci-normal Permanganate Solution is diluted in the ratio between this number of c.c. and 20. To ensure correctness the solution is re-standardised with a further quantity of the Volumetric Oxalic Acid Solution, and in the event of the solutions not agreeing a further adjustment is made until the solutions are in strict accord.

The finished solutions should be kept in well-stoppered glass bottles of a dark amber colour and protected as far as possible from contact with dust and light.

B.P.—Not included. See Table.

U.S.P.—A solution containing 3·1396 grammes of pure crystallised Potassium Permanganate in 1000 c.c. of Water, measured at 25° C. (77° F.). It is prepared by dissolving 3·3 grammes of pure crystallised salt by the addition of 1000 c.c. of Distilled Water. The solution being boiled for about 5 minutes, the flask is then plugged with Cotton-Wool and the suspended matter allowed to deposit; the clear portion of the solution being poured off, the Water used for dilution is Water that has been distilled over Potassium Permanganate. The solution is standardised against 10 c.c. of an accurately standardised Tenth-normal Volumetric Oxalic Acid Solution with the addition of 1 c.c. of pure concentrated Sulphuric Acid; the Permanganate Solution being diluted in the usual manner with sufficient Distilled Water to produce a strictly Tenth-normal Solution. An alternative method of standardisation is also mentioned. A measured quantity of 20 c.c. of the approximate Permanganate Solution is introduced into a solution of about 1 gramme of Potassium Iodide in 10 c.c. of diluted Sulphuric Acid, and the mixture diluted with 200 c.c. of Distilled Water. The liberated Iodine is titrated with an accurately standardised Tenth-normal Volumetric Sodium Thiosulphate Solution. The number of c.c. of the latter solution is noted carefully and the solution diluted in the ratio between the number of c.c. of Permanganate Solution which should have been required and the above number. The *U.S.P.* requires that a fresh trial in the manner described immediately above should be made after dilution, and if necessary a new adjustment should be made to render the correspondence between the solutions perfect.

P.G.—Not included. See Table.

TENTH-NORMAL VOLUMETRIC SODIUM CHLORIDE SOLUTION.

This solution is very little used, and is chiefly employed for the titration of Silver salts or for the standardisation of Volumetric Silver Nitrate Solution. The *U.S.P.* describes the method of preparing pure Sodium Chloride, but a very pure salt may be obtained so cheaply that it is questionable whether it is worth while to specially prepare the pure Chloride in the laboratory.

B.P.—Not included. See Table.

U.S.P.—A solution containing 5·806 grammes of pure Sodium Chloride in 1000 c.c. It is obtained by dissolving 5·806 grammes of pure Sodium Chloride in sufficient Water to measure exactly 1000 c.c. at 25° C. (77° F.). No method is indicated for the standardisation of the solution, and when prepared with the pure Sodium Chloride may be assumed to be correct.

P.G.—Not included. See Table.

TENTH-NORMAL VOLUMETRIC POTASSIUM SULPHOCYANATE SOLUTION.

This solution is also known under the name of Volhard's Solution, and is chiefly used for the indirect titration of the Silver salts, according to Volhard's method. It is mentioned under Tenth-normal Volumetric Silver Nitrate Solution. Ferric Ammonium Sulphate Solution is usually employed as an indicator.

B.P.—Not included. See Table.

U.S.P.—A solution containing 9·653 grammes of pure Potassium Sulphocyanate in 1000 c.c. of Water. It is prepared by dissolving 10 grammes of pure crystalline Potassium Sulphocyanate (which is required to be free from Antimony, Arsenic, Cadmium, Copper, Iron, Lead, Zinc and Sulphates) in 1000 c.c. of Water. It is standardised with Tenth-normal Volumetric Silver Nitrate Solution. A measured quantity of 10 c.c. of the latter solution, together with 3 c.c. of Nitric Acid (free from Nitrous Acid), being diluted with about 100 c.c. of Distilled Water. The Volumetric Sulphocyanate Solution is added from the burette until a perceptible reddish-brown tint is acquired. Ferric Ammonium Sulphate Solution is employed as an indicator. The number of c.c. is accurately noted and an ascertained volume of the remaining solution diluted in the ratio between the number of c.c. actually required to the number of c.c. which should have been required. After dilution a fresh determination should be made, using a measured quantity of 50 c.c. of Tenth-normal Volumetric Silver Nitrate Solution, 5 c.c. of Ferric Ammonium T.S., 5 c.c. of Nitric Acid and 200 c.c. of Water, and the solution should be so adjusted that exactly 50 c.c. of the Potassium Sulphocyanate Solution should be required to produce the above-mentioned tint. If necessary, a further adjustment should be made until the solutions strictly correspond.

P.G.—Not included. See Table.

ALKALINE CUPRIC TARTRATE SOLUTION.

Potassio-cupric Tartrate Solution, Alkaline Cupric Tartrate Solution, or Fehling's Solution, consists of two solutions. The first solution contains 69·28 grammes of crystallised Copper Sulphate and 1 c.c. of Sulphuric Acid in 1000 c.c. of Water, and is prepared by dissolving 34·64 grammes of crystallised Copper Sulphate in sufficient Water to effect solution, adding 0·5 c.c. of Sulphuric Acid and sufficient Distilled Water to produce 500 c.c. The second solution contains 352 grammes of Sodium Potassium Tartrate and 154 grammes of Sodium Hydroxide in 1000 c.c. of Distilled Water, and is prepared by dissolving 176 grammes of Sodium Potassium Tartrate and 77 grammes of Sodium Hydroxide in a sufficient quantity of Water to effect solution, and diluting with sufficient Distilled Water to produce 500 c.c. When required for use the solution of Copper Sulphate is mixed with an equal quantity of the alkaline Tartrate; the above solution is seldom employed volumetrically. Pavy's Solution, described on p. 468, is more convenient, and is more generally employed in volumetric work.

B.P.—The *B.P.* solution is on the lines indicated above. It is not employed volumetrically in the official volume.

U.S.P.—The *U.S.P.* alkaline Cupric Tartrate Solution is employed volumetrically. It consists of two solutions:—1. The Copper Solution, which is prepared by dissolving 34·67 (more correctly 34·6663) grammes of carefully selected uneffloresced pure Cupric Sulphate, free from adhering moisture, in a sufficiency of Distilled Water, and diluting to measure 500 c.c. at 25° C. (77° F.). The solution is directed to be kept in small, well-stoppered bottles. 2. The Alkaline Tartrate Solution, which is prepared by dissolving 173 grammes of crystallised Potassium Sodium Tartrate together with 75 grammes of Potassium Hydroxide in a sufficiency of Water to measure exactly 500 c.c. at 25° C. (77° F.). This solution is directed to be kept in small bottles fitted with rubber stoppers. When required for use the solutions are mixed in equal volumes.

P.G.—A weighed quantity of 3·5 grammes of Copper Sulphate is dissolved in 30 c.c. of Water, and the solution mixed with a solution of 17·5 grammes of Sodium Potassium Tartrate in 30 c.c. of Water, the latter solution having been previously mixed with 40 grammes of Sodium Hydroxide Solution (15 p.c.).

TENTH-NORMAL VOLUMETRIC AMMONIUM RHODANATE SOLUTION.

This solution is employed by the *P.G.* instead of Tenth-normal Volumetric Potassium Sulphocyanate Solution for the determination of the excess of Volumetric Silver Solution in the indirect Silver titration. Almost the only instance in which it is used in this volume is in the determination of Volatile Oil of Mustard.

B.P. }
U.S.P. } Not included. See Table.

P.G.—A solution containing 7·618 grammes of Ammonium Rhodanate in 1 litre. No method of preparation, standardisation, or preservation is indicated.

INDICATORS OF NEUTRALITY.

The following list shows at a glance the Solutions employed by the three Pharmacopœias as indicators in Volumetric Analysis.

B.P. Cochineal Tincture.
Litmus.
Methyl Orange.
Phenolphthalein.
Starch Mucilage.
Turmeric Tincture.
U.S.P. Brazil Wood T.S.
Cochineal T.S.
Hæmatoxylin T.S.
Iodeosin T.S.
Litmus paper and T.S.
Methyl Orange T.S.
Phenolphthalein T.S.
Rosolic Acid T.S.
Starch T.S.
Turmeric Tincture.
P.G. Hæmatoxylin.
Iodeosin Solution.
Litmus paper.
Phenolphthalein Solution.
Rosolic Acid Solution.
Starch Solution.
Turmeric paper.
Turmeric Tincture.

BRAZIL WOOD SOLUTION.

Brazil Wood solution is coloured yellow by acids and crimson-red by alkalis. It is used chiefly as an indicator of neutrality in the titration of alkaloids.

B.P. }
P.G. } Not included. See Table.

U.S.P.—A solution obtained by boiling 50 grammes of finely cut Brazil Wood for 30 minutes with 100 c.c. of Water, the evaporated Water being replaced from time to time. The mixture is allowed to cool, strained, 100 c.c. of the strained liquid are mixed with 25 c.c. of Alcohol (94·9 p.c.), the solution filtered. It is required that the solution be excluded from contact with ammoniacal vapours.

COCHINEAL SOLUTION.

Cochineal solution assumes a yellow or yellowish-red coloration with acids, and a violet coloration with alkalis. As an indicator it is used chiefly in the titration of alkaloids.

It may be employed as an indicator of neutrality in the titration of solutions containing Ammonia, and affords a useful means of judging the neutrality of Ammonium Acetate and Ammonium Citrate Solutions, *see* Liquor Ammonii Acetatis and Liquor Ammonii Citratis. It may also be used for the titration of inorganic acids.

B.P.—The solution employed by the *B.P.* is the official Tincture of Cochineal described on p. 421.

U.S.P.—A filtered solution prepared by macerating 1 gramme of unbroken Cochineal for 4 days with a mixture of 20 c.c. of Alcohol (94·9 c.c.) and 60 c.c. of Water. The *U.S.P.* states that it is useless for titrating organic acids.

P.G.—Not included. See Table.

HÆMATOXYLIN SOLUTION.

A solution containing 0·2 p.c. w/v of Hæmatoxylin prepared by dissolving 0·2 of a gramme of Hæmatoxylin in sufficient Alcohol (90 p.c.) to produce 100 c.c. The solution is used as an indicator of neutrality in the titration of alkaloids. It assumes a yellow or orange colour in acid solutions and a violet to purple colour in alkaline solutions. It is advisable in working with this indicator to experiment side by side with an equal quantity of a neutral liquid containing exactly the same amount of the solution as has been added to the liquid under titration, as very different tints may be assumed according to the volume of the solution used.

B.P.—Not included. See Table.

U.S.P.—A 0·2 p.c. w/v solution of Hæmatoxylin prepared by dissolving 0·2 of a gramme of crystalline Hæmatoxylin in 100 c.c. of Alcohol (94·9 p.c.). The *U.S.P.* specifies about 5 drops are to be used for each titration. The titration is to be considered complete when the change in colour remains permanent upon the addition of 1 drop of the volumetric solution after stirring the liquid.

P.G.—A solution prepared by dissolving a crystal of Hæmatoxylin in 1 c.c. of Alcohol (90 p.c.). The instructions are to use a solution of this composition as an indicator for each titration.

IODEOSIN.

A solution containing 0·1 p.c. w/v of Iodeosin [(Tetraiodfluorescein) $C_{20}H_8I_4O_5$, eq. 829·20] prepared by dissolving 0·1 of a gramme of Tetraiodfluorescein in 100 c.c. of Alcohol (90 p.c.). The solution is colourless in the presence of acids, but assumes a pink coloration in the presence of alkalis. It is an extremely sensitive indicator, and is suitable for the titration of minute quantities of alkaloids. The Alcohol used in its preparation should be absolutely neutral.

B.P.—Not included.

U.S.P.—A 0·1 p.c. w/v solution of Iodeosin in 100 c.c. of Alcohol (94·9 p.c.) prepared by dissolving 0·1 of a gramme of Iodeosin in 100 c.c. of Alcohol (94·9 p.c.). The *U.S.P.* recommends the volume of the solution titrated should be about 100 c.c. 20 c.c. of Ether should be added and 5 drops of the Iodeosin T.S., the solution being well shaken after each addition of Volumetric Alkali solution. The titration is continued until a faint pink colour remains after vigorous shaking.

P.G.—A solution containing 0·2 p.c. w/w of Iodeosin prepared by dissolving 1 part by weight of Iodeosin in 500 parts by weight of Alcohol (90 p.c.). The directions given in the *P.G.* for the verification of the indicator are as follows: To 100 c.c. of Water contained in a flask of white glass is added sufficient Ether to form a layer 1 cm. in depth, 1 drop of Hundredth-normal Volumetric Hydrochloric Acid Solution and 5 drops of Iodeosin Solution are added, after vigorous shaking the lower aqueous layer should remain uncoloured, but if 2 drops of Hundredth-normal Volumetric Potassium Hydroxide Solution be added, after vigorous shaking the lower aqueous layer should be coloured pale rose.

LITMUS.

Litmus is the blue colouring matter prepared from various species of Roccella. It occurs commercially in small, dark blue, rectangular cubes, possessing a characteristic floral odour. It is employed in the form of a solution, or as **Litmus paper.** It is unaffected by alkalis, but changes to a red colour on the addition of acid, and this red colour is restored to blue when the solution is again rendered alkaline. It is employed for the titration of acids and alkalis, acid salts, and occasionally in the titration of alkaloids and alkaloidal acid salts, *e.g.*, Quinine Bihydrochloride, but its use in the latter instance is not altogether satisfactory. It yields no satisfactory end reaction with Boric Acid. The titration of Carbonates with this indicator is a tedious process, owing to the necessity of boiling off Carbonic Anhydride before a definite end reaction can be obtained. **Solution of red Litmus** is prepared by the cautious addition of a very dilute Hydrochloric Acid Solution, only just sufficient to ensure a faint red colour being added. Red Litmus paper is prepared by impregnating white bibulous paper with the above solution, and drying.

B.P.—The Litmus of the *B.P.* is obtained from various species of Roccella.

U.S.P.—The *U.S.P.* does not mention the source of the Litmus.

P.G.—Not described.

LITMUS SOLUTION.

A solution of Litmus may be prepared by repeatedly exhausting the cubes with Water until all soluble matters have been extracted, evaporating the mixed extracts to a small bulk, adding sufficient Acetic Acid to decompose Carbonates, evaporating to a thick extract and adding a large quantity of Alcohol (90 p.c.) which precipitates the blue colour, the latter is washed with hot Alcohol (90 p.c.) and dissolved in Water. **Blue** or **red Litmus paper** may be prepared by dipping strips of calendered or unsized paper in either the blue or red solution, and drying.

B.P.—A filtered solution of Litmus prepared by exhausting 10 grammes of Litmus for 1 hour with 3 successive portions of Alcohol (90 p.c.), using first 40, 30, and finally 30 c.c. The Litmus (from which all matter soluble in Alcohol of this strength has been removed) is digested in 100 c.c. of Distilled Water.

U.S.P.—A filtered solution of Litmus prepared by exhausting powdered Litmus for 1 hour with 3 separate quantities consisting of about 4 times its weight of boiling Alcohol (94·9 p.c.) in order to remove Erythrolitmin; the superfluous Alcohol is allowed to drain off and the residue digested with an equal weight of cold Water and filtered. This solution after being acidulated may be used to prepare **red Litmus paper**. The residue is extracted with about 5 times its weight of boiling Water, and after it has been thoroughly cooled, filtered, the filtrate is preserved in wide-mouthed bottles closed with a plug of Cotton-Wool. The *U.S.P.* states that an addition of 1 drop of Tenth-normal Volumetric Acid or Alkali to 50 c.c. of Water containing 5 drops of the indicator should produce a distinct change in colour. The **blue** and **red Litmus paper** of the *U.S.P.* is prepared by impregnating strips of white unsized paper, free from wood pulp, with either blue or red Litmus Solution as described above, and drying. Litmus papers should be kept in well-stoppered bottles.

P.G.—A solution prepared by digesting 10 parts by weight of Litmus for 24 hours at a temperature of 15° to 20° C. (59° to 68° F.) with 100 parts by weight of Water, the mixture being repeatedly shaken. The mixture after being allowed to deposit is filtered. It is used for the preparation of **blue Litmus paper**, the following method of procedure being adopted :—Sufficient diluted Sulphuric Acid is added to the above solution, brought to a boiling temperature to cause it to assume only a violet-blue coloration when diluted with about 100 parts by weight of Water. Strips of the best unglazed paper are coloured with this 10 p.c. w/w Litmus Solution (neutralised as described above and dried) and are then kept from the light. It is required that blue Litmus paper shall be immediately coloured red by 1 drop of a mixture of 1 c.c. of Tenth-normal Volumetric Hydrochloric Acid Solution and 100 c.c. of Water. In the preparation of **red Litmus paper** the above-mentioned Litmus Solution is mixed with sufficient diluted Sulphuric Acid until a test portion diluted with about 100 parts by volume of Water is of a pale red colour, and strips of the best unglazed paper are coloured with this 10 p.c. w/w acid Litmus Solution, dried and protected from the light. It is required that red Litmus paper should be immediately coloured blue by the addition of a single drop of a mixture of 1 c.c. of Tenth-normal Volumetric Potassium Hydroxide Solution and 100 c.c. of Water. Both **blue** and **red Litmus paper** are directed to be preserved in well-closed vessels protected from the light.

METHYL ORANGE. Poirrier's Orange III.

Methyl Orange, Helianthin $NaC_{14}H_{14}N_3SO_3$. Poirrier's Tropæolin D.

An orange-yellow powder readily soluble in Water, sparingly soluble in Alcohol (90 p.c.). Commercially it is the Ammonium or Sodium salt of Dimethyl-amidoazobenzenesulphonic Acid or Para-sulphobenzene-azodimethylaniline, a body produced by the action of Dimethylaniline on Diazobenzene-sulphonic Acid. The *B.P.* and the *U.S.P.* employ the Sodium salt. The addition of Hydrochloric Acid to a hot concentrated aqueous solution precipitates the free Sulphonic Acid, basic Lead Acetate Solution throws down an orange-yellow precipitate. It should yield no precipitate with Barium Chloride or Calcium Chloride Solution, nor on the addition of an alkali Hydroxide Solution.

METHYL ORANGE SOLUTION.

A solution containing 0·1 p.c. w/v of Methyl Orange. It may be prepared by dissolving 0·1 of a gramme of Methyl Orange in 50 c.c. of Distilled Water, adding 10 c.c. of Alcohol (90 p.c.), mixing thoroughly and diluting with sufficient Distilled Water to measure 100 c.c. and filtering. It is used as an indicator of neutrality for the titration of acids and alkalis, and is of special service in the titration of Carbonates, as the latter do not effect the end reaction, and the necessity for boiling off the Carbonic Anhydride is obviated. It is not a satisfactory indicator for use in titration of organic acids, such as Oxalic, Acetic, Citric or Tartaric, as the end reaction is indefinite. It is employed in the titration of alkaloids and alkaloidal salts. Care should be taken that only a minimum quantity of the solution should be used in the titration, the end reaction being more delicate the smaller the quantity of solution employed compatible with the observance of a true end reaction. It affords a yellow coloration with alkalis, and a pink or reddish coloration with acids.

B.P.—A solution containing 0·2 p.c. w/v of Methyl Orange in a mixture of Alcohol (90 p.c.) and Distilled Water, prepared by dissolving 0·2 of a gramme of Methyl Orange in Distilled Water, adding 25 c.c. of Alcohol (90 p.c.) and sufficient Distilled Water to produce 100 c.c.

U.S.P.—A solution containing 0·1 p.c. w/v of Methyl Orange prepared by dissolving 1 gramme of Methyl Orange in sufficient Water to produce 1000 c.c. It is mixed with just sufficient Tenth-normal Volumetric Sulphuric Acid Solution to colour the liquid red, and until it just ceases to be transparent and then filtered. The *U.S.P.* directions for carrying out the titrations with this indicator are that 1 to 3 drops are sufficient for the volume of from 50 to 100 c.c. It is not to be employed in alcoholic or boiling solutions.

P.G.—Not included.

PHENOLPHTHALEIN.

Phenolphthalein is described on p. 881.

PHENOLPHTHALEIN SOLUTION.

A solution containing 0·5 p.c. w/v of Phenolphthalein prepared by dissolving 0·5 of a gramme of Phenolphthalein in 50 c.c. of Alcohol (90 p.c.), and diluting with sufficient Distilled Water to produce 100 c.c. This affords a convenient strength for use as an indicator of neutrality. It is colourless in acid or strictly neutral solutions, but assumes a fine pink coloration in the presence of even a minute quantity of alkali. It is employed in titrating acids and alkalis. It is the most convenient indicator of neutrality for organic acids, *e.g.*, Acetic, Tartaric, Citric, Oxalic and Valerianic Acids, etc. It is, however, useless for the titration of free Ammonia or Ammonium salts or other fixed alkalis when Ammonium salts are present. It may be used in the titration of Carbonates or

Bicarbonates if the precaution of boiling off Carbonic Anhydride is observed. Its utility in this respect, however, is inferior to Methyl Orange Solution. The great advantage is that it may be used in alcoholic solutions or mixtures of Alcohol and Ether, and many organic acids insoluble in Water may thus be titrated. It may also be used for determining the proportion of acid radical present in alkaloidal salts, the salt may be dissolved in a sufficiency of Distilled Water, sufficient Ether to form a separate layer and to hold the liberated alkaloid in solution is added and titration carried out.

B.P.—A solution containing 0·2 p.c. w/v of Phenolphthalein prepared by dissolving 0·2 of a gramme of Phenolphthalein in 60 c.c. of Alcohol (90 p.c.), and adding sufficient Distilled Water to measure 100 c.c.

U.S.P.—A 1 p.c. w/v solution of Phenolphthalein prepared by dissolving 1 gramme of Phenolphthalein in 50 c.c. of Alcohol (94·9 p.c.) and diluting with sufficient Water to produce 100 c.c. The *U.S.P.* employs **Phenolphthalein Paper** which is prepared by soaking white unsized paper in the solution, and drying. The *U.S.P.* recommends 3 drops of the solution as a sufficient quantity for use with 50 c.c. of solution to be titrated.

P.G.—A solution containing 1 p.c. w/w of Phenolphthalein obtained by dissolving 1 part by weight of Phenolphthalein in 99 parts by weight of Alcohol (68 to 69 p.c.).

ROSOLIC ACID SOLUTION.

A solution containing 0·2 p.c. w/v of Rosolic Acid, Methylaurin or Corallin, $C_{20}H_{16}O_3$, eq. 301·84.

Rosolic Acid is obtained by the action of Nitrous Acid on Pararosaniline or Rosaniline, or by treating a dilute solution of Aniline Hydrochloride with Sodium Nitrite, which results in the formation of Diazorosaniline Hydrochloride, which when boiled with the addition of Sulphuric Acid affords Rosolic Acid. The solution is prepared by dissolving 0·2 of a gramme in sufficient Alcohol (60 p.c.) to measure 100 c.c. The colour of the solution, which is pale yellow, is unaffected by acids, but in the presence of alkalis a violet-red colour is assumed. It is employed chiefly in the titration of Ammonia and Ammonium salts, and in the titrations involving the use of Sodium or Potassium Sulphites, such as the determination of Citral in Lemon Oil. It is also employed in the determination of Formaldehyde. It is not suitable for the titration of Carbonates, nor, with the exception of Oxalic Acid, for organic acids.

B.P.—Not included. See Table.

U.S.P.—A solution containing 1 p.c. w/v of commercial Rosolic Acid prepared by dissolving 1 gramme of the commercial acid in 10 c.c. of Alcohol (48·9 p.c.), and adding sufficient Water to measure 100 c.c. The quantity recommended by the *U.S.P.* for each 100 c.c. of solution to be titrated is 0·5 c.c. The use of Pæonin (Aurin, R.) is permitted in the place of Rosolic Acid. When used for the titration of ammoniacal solutions the *U.S.P.* requires that they should be highly diluted.

P.G.—A solution containing 1 p.c. w/w of Rosolic Acid prepared by dissolving 1 part by weight of Rosolic Acid in 100 parts by weight of Alcohol (90 p.c.).

STARCH TEST SOLUTION.

A solution containing 1 p.c. w/v of Starch prepared by triturating 1 gramme of pure Potato Starch with 10 c.c. of Water, mixing with 30 c.c. of boiling Water, boiling for a few minutes, cooling, diluting with sufficient Distilled Water to produce 50 c.c. and mixing with an equal volume of Glycerin. A solution of this strength, after filtration or decantation from insoluble cell envelopes, will keep bright for years. It is employed as a sensitive reagent for Iodine.

B.P.—A recently prepared solution containing approximately 2 p.c. of Starch prepared by rubbing 1 gramme of Starch with sufficient Distilled Water to produce a smooth paste, and adding a further sufficient quantity of Distilled Water to produce 50 c.c., boiling for a few minutes, and cooling.

U.S.P.—A freshly prepared and filtered solution 'containing approximately 0·5 p.c. w/v of Starch prepared by triturating 0·5 of a gramme of Starch with

5 c.c. of Water and adding sufficient boiling Water with constant stirring to measure 100 c.c.

P.G.—A filtered solution of indefinite strength prepared by shaking a small piece of white Starch with hot Water and filtering the solution.

TURMERIC.

Turmeric as an indicator is seldom used in the three Pharmacopœias; when required the Tincture is usually employed. Its chief use is for the detection of Boric Acid. Strips of Turmeric paper so immersed in a solution of free Boric Acid or in an acidified solution of a Borate that only one half the paper is coloured, yield when dried a brown coloration if Boric Acid is present, changing to a dark green or greenish-black on the addition of a fixed alkali solution, or on the addition of Ammonia Solution.

B.P.—A Tincture of Turmeric prepared by macerating 1 of bruised rhizome to 6 of Alcohol (90 p.c.). Turmeric paper is unglazed white paper which has been soaked in this Tincture and dried.

U.S.P.—A filtered Tincture prepared by first exhausting a convenient quantity of brown Turmeric root with repeated small quantities of Water, and digesting the dried residue with 6 times its weight of Alcohol (94·9 p.c.) for several days. **Turmeric paper** is white unsized paper impregnated with the Tincture and dried.

P.G.—A Tincture prepared by digesting at a gentle heat 10 parts of coarsely powdered Turmeric root with 75 parts by weight of Alcohol (90 p.c.) with frequent shaking. After being allowed to deposit, the liquid is filtered. It is used for the preparation of Turmeric paper, and for this purpose 10 parts by weight of the above Tincture are diluted with 30 parts by weight of Alcohol (90 p.c.) and 40 parts by weight of Water and strips of the best unglazed paper are impregnated with this mixture, and whilst protected from the light are dried at the ordinary temperature of the air. **Turmeric paper** should assume a brown coloration on the addition of a single drop of a mixture prepared by mixing 1 c.c. of Tenth-normal Volumetric Potassium Hydroxide Solution and 25 c.c. of Water.

It should be kept in well-closed vessels and protected from the light.

THERMOMETRIC MEMORANDA

AND

SPECIAL TESTS.

The *B.P.* requires that the Thermometers used for the determination of temperatures at which specific gravities, melting points or boiling points are taken should be compared with a standard Thermometer, and any inaccuracy noted, corrections made where necessary, and also that the Zero points of the instruments should be verified from time to time. It inserts definite instructions for the determination of the **melting points** of substances mentioned in the Pharmacopœia, but the object of this detailed description is not apparent, as will be seen on page 6 of the Materia Medica, Professor Attfield having stated that 'in the future it must distinctly be understood that the method described in the *B.P. Appendix* has not necessarily been the one by which the melting points in the Pharmacopœia have been determined.' In the case of Cera Flava and Cetaceum the Pharmacopœia gives specific instructions for the determination of the melting point.

The medium used for raising, to the necessary temperature, the capillary tube in which the melting points are taken is Water, if the substance melts below 100° C. (212° F.), whilst liquid Paraffin, Hard Paraffin or Glycerin are suitable vehicles for substances melting at higher temperatures. The *B.P.* mentions Sulphuric Acid, but where substances equally suitable are available such a strong mineral acid is undesirable and may be dangerous. The *B.P.* gives the following formula by which a corrected melting point may be calculated with approximate accuracy from the observed melting point:—

Corrected temperature $= T + 0{\cdot}000143\ (T - t)\ N$.

T equals the observed or uncorrected temperature; t equals the mean temperature of the emergent column; N equals the length of the emergent column in scale degrees.

The **boiling point** of the substance is determined in a distillation flask with side leading tube; the bulb of the thermometer is passed through a cork closing the neck of the flask, and, although not actually immersed in the liquid, should be near it, and the whole of the thread of Mercury should, if possible, be surrounded by the vapour. In the case of Amyl Nitrite the *B.P.* inserts the words, 'the bulb of the thermometer, not dipping below the surface of the residual liquid.' Power (*Y.B.P.* '00, 324) states it is not clear why the word residual is inserted when the bulb of the thermometer should not at any time dip below the surface of the liquid.

SPECIAL TESTS.

The more important of the special tests which are referred to in the present volume are those adopted for the detection of Arsenic, for which the **modified Gutzeit's** or **Bettendorf's** test is used; the *U.S.P.* **Time-limit test for heavy metals**; the methods for the determination of the **Saponification value** and **Iodine value** of fixed oils; the **Maumené Sulphuric Acid test**; the determination of the **Acid, Ester** and **Saponification values** of Gums and Gum-resins.

THE MODIFIED GUTZEIT'S TEST.—The *B.P.* inserts a limit for arsenical contamination only in the monograph on Glycerin depending on Siebold's modification of Gutzeit's test, which is capable of approximately estimating about 1 part of Arsenic in 250,000 parts of Glycerin. The *U.S.P.* describes the test in detail, and the general directions to be followed are contained essentially in the following brief outline: 2 grammes of Zinc, which is required to be free from Arsenic, Sulphur and Phosphorus, which should not contain more than 0·05 p.c. of Iron, and should otherwise correspond to all the *U.S.P.* tests for Zinc, 20 c.c. of (8 p.c.) Arsenic-free Hydrochloric Acid and 5 c.c. of Water are introduced into a flask, and first a roll of clean dry gauze and then a piece of test-gauze, consisting of a piece of cheese-cloth about 1 decimetre square soaked in Lead Acetate Solution, is introduced into the neck of the flask and pressed with sufficient firmness to retain its place; 1 cm. space should be allowed above the gauze, the top of the flask, after being securely covered by folding over it a piece of pure white filter paper, the centre of which has been moistened with a drop of a saturated alcoholic Mercuric Chloride Solution, and the paper dried, the moistening being repeated with 2 successive drops of the same solution, and in each instance re-dried. The reaction between the Zinc and Hydrochloric Acid is allowed to proceed until the major portion of the Zinc has passed into solution. If no yellow or orange colour appears on the Mercuric Chloride test-paper, the materials may be considered sufficiently pure for a trial of a direct test. While the blank test is being carried out, a flask containing a similar mixture of Zinc and 8 p.c. Hydrochloric Acid, together with 5 c.c. of the 1 in 10 solution of the substance to be tested, is prepared, a wad of clean dry gauze, followed by the Lead Acetate test gauze, is introduced, and, after observing the same precautions as above, the Mercuric Chloride test-paper is fastened over the top; after the lapse of at least half an hour, the Mercuric Chloride test-paper is examined for the presence of a yellow stain. A distinct yellow or orange spot indicates the presence of Arsenic, much in excess of 1 in 100,000. In preparing a solution of the chemical for testing, 5 c.c. of the 1 in 10 aqueous solution, or a solution of the residue remaining after special treatment in 5 c.c. of Water, is mixed with 1 c.c. of a mixture of equal volumes of Sulphuric Acid and Water, followed by 10 c.c. of a freshly-prepared saturated solution of Sulphurous Acid; the liquid is heated in a small beaker upon a bath of boiling Water until it is free from excess of Sulphurous Acid, and has been reduced to a volume of 5 c.c. In testing for Phosphorus compounds, *e.g.*, Hypophosphorous Acid, complete oxidation of the sample is necessary before employing the modified Gutzeit's test.

BETTENDORF'S TEST.—The *B.P.* does not mention the Bettendorf test for Arsenic; the general directions contained in the *P.G.* will be found under the headings of the respective monographs of those chemicals in which it is used as a test. The *U.S.P.* adds 5 c.c. of a saturated absolutely-freshly-prepared Stannous Chloride Solution in pure concentrated Hydrochloric Acid to 5 c.c. of a solution of the prescribed quantity of the substance in pure concentrated Hydrochloric Acid, heats for 15 minutes in a water-bath of boiling Water, allows the tube to stand for one hour. When the tube is examined over a white surface, a brownish tint is observed in the presence of Arsenic beyond the permissible amount. The tube should be viewed from above and compared with a mixture of 5 c.c. each of pure concentrated Hydrochloric Acid and a similarly prepared Stannous Chloride Solution.

THE U.S.P. TIME-LIMIT TEST FOR HEAVY METALS.—The *U.S.P.* has combined a limit of time with the Hydrogen Sulphide test for heavy metals. 10 c.c. of a 1 in 20 aqueous solution of the substance under examination is introduced into a test-tube of about 40 c.c. capacity, is acidulated with 1 c.c. of diluted Hydrochloric Acid, warmed to about 50° C. (122° F.), and an equal volume of freshly-prepared Hydrogen Sulphide T.S. added; the mixture allowed to stand in the well-stoppered test-tube at a temperature of 35° C. (95° F.) for at least half an hour. At the end of this time any coloration or turbidity is correctly noted, Ammonia Water is added in excess, and the solution again examined for coloration or turbidity; care should be taken to ensure an excess of Hydrogen Sulphide throughout the test. A comparison is made in a test-tube containing similar ingredients, but without the substance under examination, the observation being made crosswise by a reflected light against a white surface. The 1 in 20 dilution of the substance to be examined has been extended by the Committee of Revision to a dilution of a 1 in 100; for Iron the total dilution is extended to 1 in 300. For chemical substances to be tested for Antimony and Arsenic dilution has not been extended; it remains at 1 in 20. This test detects Antimony, Arsenic, Cadmium, Copper, Iron, Lead and Zinc, if present.

SAPONIFICATION VALUE.—The Saponification value represents in milligrammes the weight of pure Potassium Hydroxide required to saponify 1 gramme of the fixed Oil or Fat. The *B.P.* has not yet introduced Saponification values for fixed Oils and Fats. Saponification values are included in both the *U.S.P.* and the *P.G.*, the methods adopted by the latter Pharmacopœia being generally given in the text under the heading of the individual fixed Oil. The general directions for the *U.S.P.* determination are as follows: A weighed quantity of 1·5 to 2 grammes of the purified and filtered Fat is introduced into a flask, together with 25 c.c. of Half-normal Volumetric Alcoholic Potassium Hydroxide Solution, a small funnel is placed in the neck of the flask, which is then heated on a water-bath for half an hour, 1 c.c. of Phenolphthalein T.S. is added, and the excess of the Volumetric Alcoholic Potassium Hydroxide Solution determined with Half-normal Volumetric Hydrochloric Acid Solution. A blank test is carried out alongside the determination. The difference between the number of c.c. of Half-normal Volumetric Hydrochloric Acid Solution used in the blank test and in the actual determination is multiplied by 27·87 and divided by the weight in grammes of the Fat or Oil.

IODINE VALUE.—The Iodine value represents the percentage of Iodine required to combine with the unsaturated fatty acids present in the fixed Oil or Fat. The *B.P.* does not include Iodine values. The general directions followed by the *P.G.* are given under the heading of each individual fixed Oil or Fat. The *U.S.P.* gives the following general directions for the determination of the Iodine value: A weighed quantity of 0·3 of a gramme of the fixed Oil or Fat is dissolved in 10 c.c. of Chloroform contained in a bottle of 250 c.c. capacity, a measured quantity of 25 c.c. of a mixture of equal volumes of Alcoholic Iodine T.S. and alcoholic Mercuric Chloride T.S. is introduced, the bottle stoppered, set aside in a cool place protected from the light for 4 hours, an excess of Iodine being ensured throughout this period. A measured quantity of 20 c.c. of Potassium Iodide T.S. is added, and 50 c.c. of Water; the excess of Iodine is titrated with Tenth-normal Volumetric Sodium Thiosulphate Solution, the number of c.c. is noted, a blank experiment made with the same actual quantities of reagents is carried out, the Iodine being determined by the same standard solution. The number of c.c. of Tenth-normal Volumetric Sodium Thiosulphate Solution used in the actual test is deducted from the number of c.c. of Tenth-normal Volumetric Sodium Thiosulphate Solution used in the blank, the difference multiplied by 12·59 and the product divided by 3.

The **alcoholic Iodine T.S.** is prepared by dissolving 25 grammes of Iodine (*U.S.P.*) in 500 c.c. of Alcohol (94·9 p.c.). The **alcoholic Mercuric Chloride T.S.** is prepared by dissolving 30 grammes of Mercuric Chloride $HgCl_2$ (corresponding to the *U.S.P.* requirements) in 500 c.c. of Alcohol (94·9 p.c.).

Alcohol (90 p.c.) in place of Alcohol (94·9 p.c.) is used in preparing the corresponding solutions of the *P.G.*

MAUMENÉ'S SULPHURIC ACID TEST.—Maumené's Sulphuric Acid test indicates the rise of temperature occurring when a weighed quantity of a fixed Oil is mixed with a specified amount of Sulphuric Acid. A weighed quantity of 50 grammes of the oil is introduced into a 7 oz. beaker, which, together with the strong Sulphuric Acid, is immersed in a capacious vessel of Water until they are both of the same temperature, which should not be far from 20° C. (68° F.). The beaker containing the whole is then wiped and placed in a cotton-wool nest, previously made for it in a wider beaker. The thermometer is then immersed and the temperature noted. A measured quantity of 10 c.c. of concentrated Sulphuric Acid is allowed to run into the oil, the mixture meanwhile being constantly stirred with the thermometer, and about one minute being allowed for the acid to run in; the stirring is continued until no further rise of temperature takes place. The point is readily observed, as the indication remains constant for a minute or two before the temperature begins to fall.

ACID AND SAPONIFICATION VALUES OF GUMS AND GUM-RESINS.- The Acid and Saponification values of Gums and Gum-resins represent the number of milligrammes of pure Potassium Hydroxide required to saponify respectively the free Acid and the free Acids plus the combined Esters in 1 gramme of the sample. The Ester value represents the difference between the Acid and Saponification value. The *B.P.* does not include such figures. Where such figures are given in the *U.S.P.* the method of their determination generally appears under the heading of each individual subject. Figures relating to determinations made in the author's laboratory refer to the methods indicated by Dieterich in his *Analysis of Resins, Balsams and Gum-resins.*

SPAS IN BRITAIN.

BATH (Somersetshire).—The only true thermal Water in England. Saline, 21 grains in 20 oz. Chiefly Calcium Sulphate and small quantities of Sodium Sulphate and Magnesium Chloride, with Carbonic Acid gas and Nitrogen. Several baths varying in temperature from 88° to 120° F. (31·1° to 48·8° C.). For chronic rheumatism, gout, and paralysis. The Water is aerated and sold in bottles under the name of **Sulis Water.** Radium has been discovered in the Waters of Bath and Buxton.

BUXTON (Derbyshire).—A Water containing only 2¼ grains of salts in 20 oz., with Carbonic Acid gas and Nitrogen. Temp. 82° F. (27·7° C.). For chronic gout and rheumatism.

DROITWICH (Worcestershire).—Muriated. Chiefly Sodium Chloride, about 2712 grains in 20 oz., along with Sodium and Calcium Sulphates. Warm baths are given, usually at a temperature of from 98° to 101° F. (36·6° to 38·3° C.). Used in muscular rheumatism, sciatica, and in chronic rheumatic and gouty affections.

FLITWICK (Ampthill, Beds.).—Chalybeate, aperient; 31 grains in 20 oz. Iron Carbonate, Magnesium and Sodium Sulphates, Magnesium Chloride and Calcium Carbonate.

HARROGATE (Yorkshire).—Several springs, sulphur and chalybeate. The old sulphur spring contains 137 grains in 20 oz., chiefly Chlorides, with Sulphuretted and Carburetted Hydrogen. Of the chalybeate Waters, the new spring contains 62 grains in 20 oz., chiefly Chlorides, with about 1½ grains Iron Chloride, together with Carbonic Acid gas and Nitrogen.

LEAMINGTON (Warwickshire).—'Old well,' saline, about 104 grains in 20 oz., chiefly Sodium and Calcium Chlorides, with Sodium Sulphate and Carbonic Acid. The saline chalybeate Waters contain about 132 grains in 20 oz., chiefly Calcium, Magnesium and Sodium Chlorides, with Sodium Sulphate and a small quantity of Iron Carbonate. In stomach and liver complaints, in gouty and rheumatic affections.

LLANDRINDOD WELLS (Wales).—Muriated, muriated-sulphur and weak chalybeate waters. The first contains Sodium Chloride (about 30 to 40 grains in 20 oz.) along with Calcium and Magnesium Chlorides. The second, in addition to being weakly muriated, contains from 1 to 14 volumes per 1000 of Hydrogen Sulphide gas, and the third about the same amount of Sodium and Calcium Chlorides as the first, along with a small amount of Iron Carbonate. Used in atonic dyspepsia, constipation, and in chronic rheumatism and rheumatoid arthritis.

LLANGAMMARCH (Wales).—Barium Water. About 38 grains in 20 oz., chiefly Sodium, Calcium and Magnesium Chlorides, with about ¾ grain of Barium Chloride. Cardiac tonic. In glandular affections, gout and rheumatism.

MALVERN (Worcestershire).—A table Water nearly pure, containing about ¾ grain of mineral salts in 20 oz. Useful in kidney and bladder affections.

STRATHPEFFER (Ross-shire).—Two springs, Upper and Lower. Sulphurous. Containing chiefly Sodium and Calcium Sulphates, with Sulphuretted Hydrogen. The Upper about 18 grains in 20 oz.; the Lower about 13½ grains and slightly less Sulphuretted Hydrogen than the Upper.

WOODHALL (Lincolnshire).—About 190 grains in 20 oz., chiefly Sodium, Calcium and Magnesium Chlorides, with Sodium and Potassium Bromides and Potassium Iodide. A 'mutterlauge' is also used. Useful in chronic rheumatism, scrofula, syphilis, etc.

SPAS.—FOREIGN.

ACHSELMANNSTEIN (Bavaria). Saline, aperient, chalybeate. About 2237 grains in 20 oz., chiefly Sodium and Magnesium Chlorides, with Sodium and Calcium Sulphates and Carbonic Acid gas. Baths and Vapour Baths for incipient tuberculosis, cutaneous diseases and uterine disorders. May to September.

ADELHEIDSQUELLE (Heilbrunn, Bavaria). Saline, about 58 grains in 20 oz., chiefly Sodium Chloride (44 grains), with Sodium Iodide ¼ grain and Bromide about ½ grain and Carbonic Acid gas. Acts on the glandular, lymphatic, and cutaneous systems. May to September. Imported.

AESCULAP (Buda-Pesth, Hungary).—Aperient, antacid. About 334 grains in 20 oz. Chiefly Sodium Sulphate (125 grains) and Magnesium Sulphate (154 grains), with Sodium Chloride and Calcium Sulphate. For habitual constipation and disorders of the liver. Imported.

AIX-LA-CHAPELLE (Rhine Province, Germany).—Several springs. Thermal. 113° to 133° F. (45° to 56·1° C.). Saline, sulphurous. About 39 grains in 20 oz., chiefly Sodium Chloride (25 grains) and Sodium Carbonate (about 5 grains), with varying quantities of Sodium Sulphide. Used in cutaneous diseases, rheumatism and syphilis. Summer season April to October. Winter season November to April. Imported.

AIX-LES-BAINS (Savoy, France).—Sulphurous. Two chief springs are 'Sulphur Spring' and 'Alum Spring.' Thermal. 109·5° to 112° F. (42·7° to 44·4° C.). About 3¾ grains in 20 oz., chiefly Sodium and Magnesium Sulphates, with Sulphuretted Hydrogen in the 'Sulphur Spring.' Rheumatism, gout, eczema. It contains the organic substance 'Glairine' or Barègine peculiar to sulphur Waters. April to November.

ALET (Aude, France).—Alkaline. Thermal. 82° F. (27·7° C.) for baths, and a ferruginous Water 50° F. (10° C.). Weak in minerals, about 4½ grains in 20 oz. Tonic in debility and dyspepsia.

ALEXANDERBAD (Bavaria).—Chalybeate. About 3 grains in 20 oz., of which about ½ grain is Iron Carbonate, with Carbonic Acid gas. May to October.

ALEXISBAD (Germany).—Chalybeate. 'Alexis-Brunnen' and 'Freundschafts-Brunnen' are used for drinking, and the 'Selke-Brunnen' for bathing, June to September.

ALLEVARD (Isère, France).—Gaseous. Iodo-sulphuretted. About 195 grains in 20 oz. Chiefly Calcium and Magnesium Carbonates, Chlorides and Sulphates, with about 0·05 grain of Iodine, Carbonic Acid gas and Sulphuretted Hydrogen. June to September.

APENTA (Hungary).—Aperient. Chiefly Sodium Sulphate (about 161 grains) and Magnesium Sulphate (about 182 grains), with Sodium Chloride and Calcium Sulphate in 20 oz. Imported.

APOLLINARIS (Neuenahr, Rhine Province, Germany).—Alkaline, gaseous. About 22 grains in 20 oz., chiefly Sodium Carbonate (about 11 grains), Chloride and Sulphate, with Magnesium Carbonate. Free Carbonic Acid gas. Imported and drunk as a table Water.

ARABELLA (Hungarian).—Aperient. Contains chiefly Magnesium and Sodium Sulphates, with Calcium Sulphate and Magnesium Chloride. For liver and kidney complaints, gastric catarrh, diabetes.

ARNSTADT (Germany).—Brine spring, for baths. About 2280 grains in 20 oz., of which 2150 grains are Sodium Chloride. Used for scrofula. 'Riedquelle' with about 34 grains Sodium Chloride in 20 oz., for drinking. April to September.

AUTEUIL (France).—Chalybeate. About 28 grains in 20 oz., about 6 grains being Iron and Aluminium Sulphates.

BADEN (Vienna). Saline and sulphurous. About 17 grains in 20 oz., chiefly Calcium, Potassium and Sodium Sulphates, with Magnesium Sulphide and Chloride. Principally used for bathing, also mineralised mud cataplasms in rheumatism. May to October.

BADEN-BADEN (Germany).—Several thermal springs, 124° to 150° F. (51·1° to 65·5° C.). 'Hauptquelle' most used for drinking. Saline, about 27 grains in 20 oz. The Lithia Waters contain about 3 grains Lithium Chloride in 20 oz. Other salts chiefly Chlorides and Carbonates of Sodium, Calcium and Magnesium, with trace of Iron Arsenate. For rheumatoid arthritis, chronic gouty affections and paralysis. May to October.

BAGNÈRES-DE-LUCHON (France).—Thermal sulphur springs, 61° to 152° F. (16·1° to 66·6° C.). About 2 grains of Iron, Manganese and Sodium Sulphides in 20 oz. Used in chronic cutaneous eruptions, catarrhal diseases of the respiratory organs, etc. June to October.

BARÈGES (Hautes-Pyrénées, France).—Thermal, sulphurous. Temp. 81° to 111° F. (27·2° to 43·8° C.). About 2 grains in 20 oz., chiefly Sodium Sulphide, Sulphate and Chloride, with Barègine similar to Glairine. 'Tambour' spring used internally, about ½ grain Sodium Sulphide per 20 oz. Skin diseases and chronic rheumatism. June to September. Imported.

BATTAGLIA (Province of Venice, Italy).—Thermal. Four springs. Temp. 136° to 160° F. (57·7° to 71·1° C.). The Waters contain about 13 grains of Sodium Chloride in 20 oz., and are similar to, but more weakly mineralised than those of Baden-Baden. Mud baths are also employed; the mud 'Fango' is exported. They are used in chronic gout and rheumatism, and in rheumatoid arthritis. May to October.

BELLTHAL (Rhine Province, Germany).—Alkaline, table Water. About 11 grains in 20 oz., chiefly Sodium, Potassium, Magnesium and Calcium Carbonates. Imported.

BERKA (Weimar, Germany).—Chalybeate and sulphurous springs. About 27½ and 16½ grains of solids respectively in 20 oz., chiefly Calcium Sulphate and Carbonate, with about 0·4 grain Iron Carbonate in the chalybeate Water. Used for chronic rheumatism, anæmia and debility.

BETHESDA (Wisconsin, U.S.A.).—About 5·3 grains in 20 oz., chiefly Calcium and Magnesium Carbonates. Used in treatment of kidney diseases.

BILIN (Bohemia).—Gaseous, alkaline. About 47 grains in 20 oz., chiefly Sodium Carbonate (about 29 grains) and Sulphate, with Calcium and Magnesium Carbonates. Taken for indigestion and acidity. Also drunk as a table Water. May to September. Imported.

BIRMENSTORF (Switzerland).—Aperient. Temp. 50° F. (10° C.). About 279 grains in 20 oz., chiefly Magnesium Sulphate (about 191 grains) and Sodium Sulphate (about 61 grains), with Calcium Sulphate and other salts. Imported.

BIRRESBORN (Rhine Province, Germany).—Alkaline, gaseous spring. About 43 grains in 20 oz., chiefly Sodium Bicarbonate (about 24 grains), with Sodium Sulphate and Magnesium Bicarbonate. Free Carbonic Acid gas. Table Water.

BOCKLET (near Kissingen).—Chalybeate. Temp. 50° F. (10° C.). Three springs varying in mineral strength, contain Sodium Chloride and Sulphate, with Calcium and Magnesium Carbonates and about 0·8 grain Iron Carbonate in 20 oz., and much free Carbonic Acid gas. Tonic, useful for anæmic and debilitated patients. May to September.

BONIFACIUS (Hesse-Nassau, Germany).—About 122 grains in 20 oz., chiefly Sodium Chloride (about 89 grains), Magnesium Chloride, Calcium Sulphate, Lithium Chloride (about 2 grains), and Magnesium Bromide and Iodide. Stimulates the intestines and urinary organs.

BONNES (Basses-Pyrénées, France). (**Eaux Bonnes**).—Thermal. Temp. 72° to 90·5° F. (22·2° to 32·2° C.). Saline and sulphurous. From about 5 to 6 grains in 20 oz., chiefly Sodium and Potassium Chlorides, with Calcium Sulphate, Sodium Silicate and 'Barègine,' with Sulphuretted Hydrogen. Used in chronic bronchitis, pharyngitis, and catarrhal affections of respiratory organs. June to September.

BORCETTE or **BURTSCHEID** (near Aix-la-Chapelle).—Springs similar to those of Aix-la-Chapelle.

BOURBOULE, LA (Puy-de-Dôme, France).—Two chief springs, 'Perrière' and 'Choussy.' Arsenical, equal to about 0·16 grain of Sodium Arsenate in 20 oz., also Sodium Chloride and Bicarbonate, about 24 grains of each. Used in affections of the respiratory organs. May to September. Imported.

BRIDES-LES-BAINS (Savoy, France).—Muriated-sulphated springs. About 16 grains of Sodium Chloride, 10 grains of Sodium Sulphate, with Calcium and Magnesium Sulphates, and minute quantities of Iron and Arsenic. Tonic with laxative action in large doses. June to September. Imported (both Salts and Water).

BRUCKENAU (Bavaria).—Chalybeate. About 0·09 grain Iron Carbonate in 20 oz. May to September.

BRUCOURT (Calvados, France).—Chalybeate. About 0·43 grain Iron Carbonate and 4·3 grains of Magnesium Sulphate in 20 oz. along with Calcium Bicarbonate. Used in anæmia and chlorosis.

BUDA-PESTH.—Several springs of bitter Water, such as Hunyadi-Janos, Apenta, and Franz Josef, *q.v.* Buda or Ofen (opposite Pesth, Hungary). Thermal. Temp. 141·5° F. (61° C.). Internally and for bathing, chiefly Sodium Sulphate and Carbonate. In gastric catarrh, obstinate constipation, and in rheumatism and eczema.

BUFFALO LITHIA (Mecklenburg Co., Va., U.S.A.).—Three springs. Most important is No. 2, which contains about 12 grains in 20 oz., chiefly Calcium Sulphate and Bicarbonate, Potassium Carbonate (about 3½ grains), with Lithium Bicarbonate (about 2¾ grains), Sulphuretted Hydrogen and Carbonic Acid gas.

BUSSANG (Vosges, France). Alkaline, ferruginous, mild laxative. About 13 grains in 20 oz., chiefly Sodium, Calcium and Magnesium Carbonates, with about 0·08 to 0·1 grain Iron Carbonate. Imported.

CAMBRUNNEN (Taunus).—Gaseous, antacid table Water. Imported.

CAPVERN (Hautes-Pyrénées, France).—Thermal. Temp. 70° to 76° F. (21·1° to 24·4° C.), chiefly Calcium Sulphate, about 9 grains in 20 oz. Used in gout and gravel.

CARABANA (Spain).—Aperient. Chiefly Sodium Sulphate, about 875 grains in 20 oz. Imported.

CARLSBAD (Bohemia).—Various springs. Thermal. Hottest is 'Sprudel.' Temp. 162·5° F. (72·2° C.). About 21 grains Sodium Sulphate, about 10 grains Sodium Bicarbonate, and about 9 grains Sodium Chloride in 20 oz., with Calcium Carbonate and Carbonic Acid gas. For constipation, liver affections, gout, rheumatism, diabetes. April to September. Imported (both Salts and Water).

CAUTERETS (Hautes-Pyrénées).—Sulphurous. Thermal. From 103° to 128° F. (39·4° to 53·3° C.). About 1¾ grains in 20 oz., of which about 0·1 grain is Sodium Sulphide. May to October. Imported.

CHALLES (Savoy, France).—Cold sulphur Waters. About 11 grains in 20 oz., of which about 4 grains are said to be Sodium Sulphide. In chronic bronchitis, catarrh of throat, and scrofula. June to October. Imported.

CHARLOTTENBRUNNEN (Silesia).—Chalybeate. About 7 grains in 20 oz., chiefly Sodium, Calcium, and Iron Carbonates.

CHÂTELDON (France).—A gaseous, alkaline table Water. Imported.

CHÂTEL-GUYON (Puy-de-Dôme, France).—Alkaline. ‘Source Gubler.’ About 72 grains in 20 oz., chiefly Calcium Bicarbonate (18 grains), Sodium Bicarbonate, Magnesium and Sodium Chlorides, with Iron Bicarbonate and Carbonic Acid gas. May to October.

CONDAL (Rubinat, Pyrénées, Spain).—Aperient. About 450 grains in 20 oz., chiefly Sodium Sulphate (about 390 grains), with Magnesium Sulphate (27 grains), Sodium Chloride and Calcium Sulphate. Useful in chronic indigestion and affections of the liver and spleen. Imported.

CONDILLAC (France).—A gaseous, alkaline drinking Water. Imported.

CONTREXÉVILLE (Vosges, France).—Several springs, principal is ‘Source Pavillon.’ About 13 grains Calcium Sulphate, 3 grains Calcium Bicarbonate in 20 oz., with minute quantities of Iron, Arsenic and Calcium Fluoride. For urinary affections and chronic cystitis. May to October. Imported.

DAX (Landes, France).—Thermal. Temp. 88° to 140° F. (31° to 60° C.). Used for baths and douches in chronic rheumatic affections. ‘Mud baths’ are also given for rheumatism, sciatica and nervous affections.

DESAIGNES (France).—Alkaline. From 27 to 36 grains Sodium Bicarbonate in 20 oz.

DRIBURG (Westphalia, Germany).—Chalybeate. About 50 grains in 20 oz., chiefly Calcium Bicarbonate (12 grains) and Sulphate (9 grains), with about ½ grain Iron Bicarbonate, and much free Carbonic Acid gas. May to October.

EILSEN (Germany).—Sulphurous. ‘Julianenbrunnen’ contains about 37 grains in 20 oz., chiefly Calcium, Sodium and Magnesium Sulphates, with Sulphuretted Hydrogen about 2·5 c. in. In gout, rheumatism and paralysis. May to September.

EMS (Germany).—Alkaline, muriated, thermal. Temp. from 80° to 120° F. (26·6° to 48·8° C.). Several springs. ‘Krahnchen,’ ‘Kesselbrunnen,’ ‘Fürstenbrunnen,’ ‘Neuequelle,’ all contain about 33 grains in 20 oz., chiefly Sodium Bicarbonate (18½ grains) and Chloride (about 9 grains), with Calcium and Magnesium Bicarbonates and over 500 vols. Carbonic Acid gas per 1000. In diseases of mucous membranes, catarrh of larynx and bronchi, gouty dyspepsia, cystitis. Imported (Water, Salts and Pastilles).

ENGHIEN (Paris).—Sulphurous, containing both Calcium Sulphide and Sulphuretted Hydrogen. For drinking and bathing. Imported.

EVIAN-LES-BAINS (Savoy, France),—Alkaline, table Waters. About 2½ grains in 20 oz., chiefly Calcium Carbonate.

FACHINGEN (Hesse-Nassau, Germany).—Alkaline. About 47½ grains in 20 oz., chiefly Sodium Bicarbonate (about 35 grains) and Calcium and Magnesium Bicarbonates, with Sodium Chloride. The spring is rich in Carbonic Acid gas. For acidity in the stomach, and in kidney and bladder diseases. Used also as a table Water. Imported.

FIUGGI (Italy).—Alkaline. About 0·6 grain each of Magnesium Carbonate and Potassium Nitrate in 20 oz., along with Calcium Carbonate, Sodium Chloride, Oxygen, Carbonic Anhydride and Nitrogen. Used in gastric catarrh, liver complaints and stomachic affections.

FRANZENSBAD (Bohemia).—Several springs, varying considerably in mineral constituents. ‘Franzensquelle,’ ‘Salzquelle,’ ‘Wiesenquelle’ and ‘Kalte Sprudel’ are for drinking, and contain Sodium Sulphate (24 to 31 grains in 20 oz.), with Sodium Carbonate, and Chloride and Iron Carbonate in varying quantities. The Chalybeate ‘Moor-baths’ are baths containing peat. Used in rheumatism and gout. May to September.

FRANZ JOSEF (Buda-Pesth).—Aperient. About 216 grains each of Sodium and Magnesium Sulphates in 20 oz., with Magnesium Chloride, Calcium Sulphate and Sodium Chloride. Imported.

FRIEDRICHSHALL (Saxe-Meiningen). Aperient. According to Liebig contained about 237 grains in 20 oz., chiefly Sodium Chloride (76 grains), Sodium Sulphate (58 grains), Magnesium Sulphate (49 grains), with Magnesium Chloride and Calcium Sulphate. In disorders of the stomach, liver and urinary organs. Imported.

GASTEIN (Austria).—Several thermal springs. Temp. from 78·5° to 121° F. (26° to 49·4° C.). About 2¼ grains in 20 oz., of which almost 2 grains are Sodium Sulphate. Chiefly used for bathing. For nervous affections. May to September.

GEILNAU (Hesse-Nassau).—Alkaline, muriated. Table water.

GEROLSTEIN (Rhine Province, Germany).—Table Water. About 19 grains in 20 oz., chiefly Sodium, Calcium and Magnesium Carbonates.

GIESSHÜBLER (near Carlsbad in Bohemia).—Table Water. About 20 grains in 20 oz., chiefly Sodium, Calcium and Magnesium Bicarbonates.

GODESBERG (Rhine Province, Germany).—Chalybeate, gaseous. 'Old' spring contains about ¼ grain Iron Bicarbonate in 20 oz. 'New' spring only used for bathing, about 0·4 grain.

GRIESBACH (Baden).—Chalybeate, gaseous. About 0·6 grain Iron Bicarbonate in 20 oz., with Sodium Sulphate and Calcium Bicarbonate.

GUBER (Srebernik, Bosnia).—Ferruginous and arsenical. About 6½ grains in 20 oz., chiefly Ferric Sulphate (about 3 grains), with Aluminium Sulphate, and about 0·05 grain of Arsenious Acid.

HALL (Upper Austria).—Muriated. Water of 'Tassilloquelle.' It contains principally Sodium Chloride, about 105 grains in 20 oz., along with about 0·008 p.c. and 0·002 p.c. of Magnesium Bromide and Iodide respectively. A bath salt is also prepared. Used in scrofulous affections. The Water is exported and known as 'Haller Iodwasser.' May to September.

HOMBURG (Hesse-Nassau, Germany).—Laxative, slightly tonic. For drinking, 'Elizabeth-Brunnen,' 'Kaiser-Brunnen,' 'Ludwig-Brunnen,' 'Luisen-Brunnen,' and 'Stahl-Brunnen.' Varying proportions of mineral constituents: all are rich in Carbonic Acid gas. Chiefly Sodium Chloride, Calcium Carbonate, Magnesium Carbonate and Chloride, with Iron Carbonate. Useful in gouty affections, dyspepsia, hysteria, anæmia and debility. May to September. Water and Salts imported.

HUNYADI-JANOS (Buda-Pesth).—Aperient. Chiefly Sodium Sulphate (about 155 grains in 20 oz.), Magnesium Sulphate (about 150 grains), with Sodium Chloride. Habitual constipation. Imported.

ISCHIA (Italy).—Principal spring, 'Gurgitello.' Thermal. Temp. 131° to 149° F. (55° to 65° C.). About 52 grains in 20 oz., chiefly Sodium Chloride and Bicarbonate, with Carbonic Acid gas. Useful in rheumatism, paralysis, skin diseases, etc. Spring and Summer.

ISCHL (Austria).—Brine baths. May to September.

JODBAD LIPIK (Slavonia, Hungary).—Alkaline. Thermal. 147° F. (63·8° C.). About 28 grains in 20 oz., chiefly Sodium Bicarbonate, with about ⅛ grain of Sodium Iodide and Carbonic Acid gas. For catarrhal affections of mucous membranes, gout, rheumatism, etc.

JOHANNIS (Hesse-Nassau).—Alkaline, table Water. Containing chiefly Sodium, Calcium and Magnesium Bicarbonates, with Sodium Chloride.

KISSINGEN (Bavaria).—Principal spring, 'Rakoczy.' About 82 grains in 20 oz., chiefly Sodium Chloride (about 54 grains), with Potassium, Lithium and Magnesium Chlorides, Calcium Carbonate and Magnesium Sulphate. Also 'Pandur-Quelle,' similar, and 'Max-brunnen' weaker. Carbonic Acid gas. Kissingen bitter Water from 'Soole' springs. For constipation, hæmorrhoids, catarrhal conditions of stomach and bowels. May to September. Imported (Salts and Water).

KOSEN (Saxony).—About 477 grains in 20 oz., chiefly Sodium Chloride (420 grains). Baths, in scrofula.

KŒNIGSDORFF-JASTRZEMB (Silesia).—Saline. About 109 grains in 20 oz., chiefly Sodium Chloride, with a little Magnesium Bromide and Iodide.

KRANKENHEIL (Bavaria).—About 7 grains in 20 oz., chiefly Sodium Bicarbonate and Chloride. In scrofulous skin diseases. May to October.

KREUZNACH (Rhine Province, Germany).—Several springs. 'Elizabethquelle,' chiefly used for drinking. About 117 grains in 20 oz., chiefly Sodium Chloride (about 90 grains), with Calcium and Magnesium Chlorides and a little Bromide and Iodide. The mother lye, from which the common salt has been crystallised, about 3100 grains in 20 oz., a large amount being Calcium Chloride. Tonic to lymphatic system. In syphilis, skin diseases, rheumatism and paralysis. Water, Salt and Brine are all imported.

KRONDORF (Bohemia).—Table Water. About 21 grains in 20 oz., chiefly Sodium, Calcium and Magnesium Bicarbonates, with Carbonic Acid gas. In gout and as a diuretic. Imported.

KRONENQUELLE (Obersalzbrunn, Silesia).—Alkaline. About 20 grains in 20 oz., chiefly Sodium Bicarbonate (about 7½ grains), with Calcium and Magnesium Bicarbonates, Sodium Sulphate, Lithium Carbonate and Carbonic Acid gas. In nephritic and arthritic affections, and in gouty diathesis. May to September. Imported.

KRONTHAL (Germany).—Table Water. Chiefly Sodium Chloride, with Calcium Carbonate and Carbonic Acid gas. Imported.

LABASSÈRE (Hautes-Pyrénées).—Sulphurous. Chiefly Sodium Chloride, with about ½ grain Sodium Sulphide in 20 oz. Bronchial and laryngeal catarrh. June to October.

LANDECK (Silesia).—Thermal. 66° to 84·2° F. (18·8° to 29° C.). Under 2 grains in 20 oz., chiefly Sodium Bicarbonate and Sulphate, with traces of Sulphide and Sulphuretted Hydrogen. For bronchial catarrh. Also 'Moor-baths,' for rheumatism.

LANGENBRÜCKEN (Baden).—Chiefly Sodium, Magnesium and Calcium Sulphates, with Carbonic Acid gas and traces of Sulphuretted Hydrogen. For hæmorrhoidal conditions, bronchial irritation and rheumatism.

LEUK or **LOÈCHE-LES-BAINS** (Switzerland).—Thermal. 102° to 124° F. (48·8° to 51·1° C.). About 18 grains in 20 oz., chiefly Calcium Sulphate, with Magnesium Sulphate. In chronic skin affections. June to September.

LEVICO (Austrian Tyrol).—Arsenical and Ferruginous. Two strengths, 'strong' and 'mild.' The strong contains about 0·07 grain Arsenious Anhydride, with about 33 grains Iron salts in 20 oz.; the mild about 0·008 grain Arsenious Anhydride, with about 8 grains of Iron salts. June to September. Imported.

LIPPIK.—*See* Jodbad Lipik.

LIPPSPRINGE (Westphalia, Germany).—'Arminiusquelle' contains about 21 grains in 20 oz., chiefly Calcium and Sodium Sulphates. In bronchial irritation and tuberculosis. May to September.

LUCCA (Italy).—Thermal. 98° to 129° F. (36·6° to 53·8° C.). About 11½ grains in 20 oz., chiefly Calcium and Magnesium Sulphates, with Sodium Chloride. Baths in gout and rheumatism. June to September.

LUHATSCHOWITZ (Moravia, Austria).—Several springs. Vincenz-, Amand- and Johann-Brunnen are the chief. Contain in 20 oz. from about 27 to 39 grains of Sodium Carbonate and 21 to 39 grains of Sodium Chloride, with Calcium Carbonate, also Sodium Iodide and Bromide, and Carbonic Acid gas. In bronchial, gastric and uterine catarrh, congested liver and hæmorrhoids. May to September.

MARCOLS (France).—Alkaline. 21 to 23 grains Sodium Bicarbonate in 20 oz.

MARIENBAD (Bohemia).—Chief springs are 'Kreuz-brunnen' and 'Ferdinand-brunnen.' The first about 92 grains in 20 oz. Second about 102 grains in 20 oz., chiefly Sodium Sulphate (44 to 45 grains), Sodium Bicarbonate (14 to 16 grains), with Sodium Chloride, and Calcium and Magnesium Carbonates. Laxative. Useful in obesity, dyspepsia, gravel, gout and chronic constipation. May to September. Imported (Salts and Water).

MEINBERG (Germany).—Several springs, varying in strength. Contain Sodium and Magnesium Sulphates, with Calcium Sulphate and Carbonate. Sulphurous mud-baths are used. For scrofula, rheumatism and gout, facial neuralgia, and generally tonic. May to September.

MERGENTHEIM (Wurtemberg).—Aperient. About 119 grains Sodium Chloride; 33 grains Sodium Sulphate; and about 22 grains Magnesium Sulphate in 20 oz., with Carbonic Acid gas. For chronic constipation, catarrh of stomach and intestines, etc.

MONDORF (Luxembourg).—Muriated, for drinking and bathing. Temp. 77° F. (25° C.), chiefly Sodium Chloride about 78 grains in 20 oz., with Calcium Chloride and Sulphate, and Magnesium Bromide and Chloride.

MONT DORÉ (France).—Source 'Madeleine' and source 'Bardon,' mostly used internally. About 18 grains in 20 oz. Thermal Waters, temp. up to 113° F. (45° C.), used for baths, drinking, inhalations, etc. For chronic laryngitis and bronchitis. June to September.

NAUHEIM (Germany).—'Kur-brunnen' and 'Karls-brunnen,' chiefly for drinking. Containing Sodium Chloride 87 to 130 grains in 20 oz. and Calcium Chloride, with Carbonic Acid gas. The bath Waters are about double this strength. Temp. 82° to 95·5° F. (27·7° to 35° C.). In cardiac affections, rheumatism, etc. A special form of treatment is adopted here, known as the 'Nauheim method.' May to September.

NENNDORF (Germany).—Sulphurous. 'Trinkquelle' only one used for drinking. About 25 grains in 20 oz., chiefly Sodium, Magnesium and Calcium Sulphates, with Calcium Chloride and Sulphuretted Hydrogen. 'Rodenberg' brine considerably stronger and used for bathing. For rheumatism, gout, cutaneous affections and catarrh of respiratory organs. May to September.

NEUENAHR.—*See* **APOLLINARIS.**

OBERSALZBRUNN (Salzbrunn, Silesia).—Alkaline. Chief spring 'Oberbrunnen,' containing about 19 grains Sodium Bicarbonate in 20 oz., with Sodium Sulphate, Magnesium and Calcium Bicarbonates and a small quantity of Lithium Bicarbonate. In nephritic affections and gouty diathesis. May to September. Imported.

OREZZA (Corsica).—Gaseous, chalybeate. A kind of ferruginous Seltzer Water agreeable to drink. Chiefly Calcium Carbonate, with about 1 grain of Iron Carbonate in 20 oz.

PFAFFERS. *See* **RAGATZ-PFAFFERS.**

PLOMBIÈRES (Vosges, France).—Thermal. 77° to 155° F. (25° to 68·3° C.). About 2½ grains in 20 oz., chiefly Sodium, Calcium and Magnesium Silicates, with Sodium Sulphate. Principally used as baths. In treatment of gastralgia, dyspepsia, and catarrhal enteritis.

POLAND (U.S.A.).—Alkaline. Contains Calcium Carbonate (1·228 grains in each U.S. gallon) along with Magnesium and Sodium Carbonates, Sodium Chloride and Potassium Sulphate. Used in chronic dyspepsia and liver congestion.

POUGUES (Loire, France).—Alkaline (calcareous). 'St. Leger' spring contains about 15 grains Calcium Bicarbonate and 6 grains Sodium Bicarbonate in 20 oz., with Magnesium Bicarbonate and Chloride. Used in dyspepsia, chronic diarrhœa, and urinary affections.

PULLNA (Bohemia).—Saline, purgative. About 310 grains in 20 oz., chiefly Sodium and Magnesium Sulphates, with Magnesium Chloride and Carbonate, and Carbonic Acid gas. Useful in obstinate constipation. Imported.

PYRMONT (Waldeck).—Several springs, chalybeate and muriated. ‘Hauptquelle’ and ‘Helenen-quelle’ are the two chief chalybeate springs used for drinking. They contain from ⅙ to ½ grain Iron Carbonate in 20 oz. The muriated Waters contain varying quantities of Sodium Chloride from 63 grains in ‘Trinkquelle’ to 288 grains in ‘Bohrlochsoole’ in 20 oz. In anæmia, debility, scrofula and functional nervous affections.

RAGATZ-PFAFFERS (Switzerland).—Thermal. Temp. 98° F. (36·6° C.). About 3 grains in 20 oz., chiefly Magnesium and Sodium Carbonates, with Sodium and Calcium Sulphates. Rich in Nitrogen. June to September.

RAKOCZI. *See* **KISSINGEN.**

RECOARO (Venetia).—Chalybeate. About 25 grains in 20 oz., chiefly Calcium Sulphate and Carbonate, Magnesium Sulphate and about ⅓ grain Iron Carbonate, with Carbonic Acid gas. May to October.

REICHENHALL (Bavarian Alps).—Numerous saline springs, most important being ‘Edelquelle,’ which contains about 2237 grains in 20 oz., of which about 2150 are Sodium Chloride. Chiefly used for baths in scrofula, catarrh of the respiratory organs, etc. May to September.

RENAISON (France).—Table Water containing Sodium and Calcium Bicarbonates.

RHENS (Rhine Province, Germany).—Muriated, alkaline, table Water.

RIPPOLDSAU (Baden).—Three springs used for drinking, ‘Josephs-quelle,’ ‘Leopolds-quelle,’ ‘Wenzelquelle.’ Chalybeate. About 33 grains in 20 oz., chiefly Calcium Bicarbonate, Sodium Sulphate and Magnesium Sulphate, with about ½ grain Iron Bicarbonate. For anæmia, also useful in pulmonary catarrh. ‘Natroine’ and ‘Schwefelnatroine’ artificially carbonated and sulphated to counteract tendency to constipation. May to September.

ROISDORF (Rhine Province, Germany).—A muriated, alkaline table Water. Chiefly Sodium Chloride and Sodium Carbonate.

ROSBACH (near Homburg, Germany).—A muriated, alkaline table Water. Chiefly Sodium Chloride and Calcium Carbonate. Imported.

ROYAT (Puy-de-Dôme, France).—Alkaline. Thermal. Temp. 68° to 95° F. (20° to 35° C.). Several springs, ‘Eugénie,’ ‘Cæsar,’ ‘St. Mark,’ ‘St. Victor.’ Source ‘Eugénie’ most highly mineralised, contains about 48 grains in 20 oz., chiefly Sodium Bicarbonate and Chloride, with Calcium Bicarbonate, and Carbonic Acid gas. For gout, uric acid diathesis, dyspepsia, chronic laryngitis and bronchitis. May to September. Imported.

RUBINAT (Pyrénées, Spain).—Natural purgative Water. About 909 grains in 20 oz., chiefly Sodium Sulphate (about 840 grains) and Magnesium Sulphate (about 28 grains), with Sodium Chloride and Calcium Sulphate. For constipation, congestion, gastric fever, etc. Imported.

SAINT BOÈS (Basses-Pyrénées, France).—Sulphurous, bituminous. About 14 grains in 20 oz., Sodium Sulphide, with Sulphuretted Hydrogen, Iodine and Arsenic. For bronchitis, laryngitis, and in pulmonary tuberculosis.

SAINT GALMIER (France).—Alkaline table Water, containing Sodium, Calcium and Magnesium Bicarbonates, and may be obtained charged with additional Carbonic Acid gas. Imported.

SAINT GERVAIS (France).—Thermal. Temp. 102° to 108° F. (38·8° to 42·2° C.). Three springs, ‘Source de Mey,’ ‘de Gontard,’ ‘du Torrent.’ Contain Sodium Sulphate, Sodium Chloride and Calcium Sulphate. In cutaneous affections, chronic rheumatism and dyspepsia. June to September.

SALIES-DE-BÉARN (Basses-Pyrénées, France).—Brine baths, containing about 1925 grains Sodium Chloride, with Magnesium and Potassium Chloride, in 20 oz.

SALINS-LES-BAINS (Jura, France).—Saline. About 198 grains Sodium Chloride in 20 oz., with about ¼ grain Potassium Bromide, and traces of Sodium Iodide. For scrofulous affections. May to September.

SALVATOR (Eperies, Hungary).—Alkaline, gaseous. With about 2½ grains Sodium Bicarbonate, 8 grains Magnesium Bicarbonate and 15 grains Calcium Bicarbonate in 20 oz. For urinary affections, etc.

SANKT-MORITZ or SAINT MORITZ (Upper Engadine, Switzerland).—Three springs, 'Alte' or 'Badequelle,' 'Paracelsusquelle' and the recently discovered 'Surpunt-quelle.' Slightly chalybeate. About 23 grains in 20 oz., chiefly Calcium, Magnesium and Sodium Bicarbonates, with Sodium Sulphate and about ¼ grain Iron Carbonate. June to September.

SARATOGA (U.S.A.).—Alterative. Chiefly Sodium Chloride, Calcium Bicarbonate, Magnesium Bicarbonate, with Sodium Iodide and Bromide. Useful in glandular and visceral obstructions and in skin diseases. 'Congress' and 'A' springs are bottled for export.

SAUERBRUNNEN (Goslar-am-Hartz, Germany).—A natural, mineral, table Water, containing chiefly Magnesium Bicarbonate and Sulphate.

SCHINZNACH (Switzerland).—Strongly sulphurous. Thermal. 82·4° to 95° F. (28° to 35° C.). Chiefly Sodium Sulphate, with Potassium and Magnesium Chlorides, and about ¾ grain Calcium Sulphide in 20 oz. Rich in Sulphuretted Hydrogen. For chronic eczema and all skin eruptions, gout and rheumatism. May to September.

SCHLANGENBAD (Nassau, Germany).—Simple thermal Water. Temp. 81·5° to 89° F. (27·2° to 31·6° C.). About 3½ grains in 20 oz., chiefly Sodium Chloride. Rich in Oxygen and Nitrogen. Useful in nervous irritability, is stated to have a sedative and beneficial influence on the skin. June, July and August.

SCHWALBACH (Nassau, Germany).—Several springs. 'Stahlbrunnen' and 'Weinbrunnen' mostly used internally. 'Paulinenbrunnen' and 'Rosenbrunnen' are used for baths. Chalybeate. Chiefly Magnesium and Calcium Bicarbonates, with ½ to ¾ grain Iron Bicarbonate in 20 oz. and excess of Carbonic Acid gas. For anæmia and leucorrhœa. June, July and August.

SEIDLITZ (Bohemia).—Bitter aperient. About 140 grains in 20 oz., chiefly Magnesium Sulphate (about 100 grains) with Sodium Sulphate and Calcium Sulphate and Carbonate.

SELTERS (Nassau).—A muriated, alkaline, table Water, containing chiefly Sodium Chloride about 20 grains in 20 oz., with Sodium, Calcium and Magnesium Bicarbonates and excess of Carbonic Acid gas. Imported.

SODEN (Nassau, Germany).—Several springs. 'Milch-,' 'Warm-,' 'Wilhelms- and 'Sool-brunnen.' Saline, containing chiefly Sodium Chloride from 22 to 140 grains in 20 oz., with Calcium and Magnesium Carbonates, and from 0·2 to 0·7 grain Iron Carbonate. For chronic laryngitis, bronchitis, gout and scrofula. May to September.

SPA (Belgium).—Several springs, principal are 'Pierre le Grand' and 'Prince de Condé.' Chalybeate, alkaline. About 49 grains in 20 oz., chiefly Magnesium, Calcium and Sodium Carbonates, with about ½ to 1 grain Iron Bicarbonate. In anæmia, menorrhagia and debility. May to October.

TARASP (Switzerland).—Several springs. 'Lucius' and 'Emerita' are sulphated, 'Bonifacius' is chalybeate. They contain about 19 grains Sodium Sulphate, 36 grains Sodium Bicarbonate, 32 grains Sodium Chloride in 20 oz., with other salts. 'Bonifacius' contains about 0·4 grain Iron Carbonate in 20 oz. Carbonic Acid gas. Useful in obesity, gout, rheumatism and skin diseases, anæmia, etc. June to September.

TAUNUS (Frankfort).—A muriated, alkaline, table Water, containing chiefly Sodium Chloride, with Calcium Carbonate and excess of Carbonic Acid gas.

THONON (France).—Weakly mineralised Waters, similar to those of Evian-les-Bains.

TCHITLI (Turkey). About 55 grains in 20 oz., chiefly Sodium Bicarbonate.

TOËPLITZ or **TEPLITZ** (Bohemia). Alkaline, thermal. Temp. 83° to 114° F. (28·3° to 45·5° C.). About 6 grains total solids in 20 oz., chiefly Sodium Carbonate about 3½ grains. Used in rheumatism, gout, paralysis and nervous affections. May to September.

VALS (France).—Several springs varying in mineral strength from 27 grains to 77 grains in 20 oz. 'Saint-Jean,' 'Précieuse,' 'Desirée,' 'Rigolette,' and 'Madeleine' are the sources mostly used in England. The Waters contain chiefly Sodium Bicarbonate, with Calcium and Magnesium Bicarbonates, and Carbonic Acid gas. In dyspepsia and gastric catarrh. May to October. Imported.

VERNET (Pyrénées-Orientales, France).—Thermal Sulphur springs, 90° to 154° F. (32·2° to 67·7° C.). About ⅓ grain Sodium Sulphide in 20 oz. Used for drinking and bathing. For rheumatism, cutaneous eruptions and affections of respiratory organs.

VICHY (France).—Alkaline, thermal. Temp. from 57° to 106° F. (13·8° to 41·1° C.). Numerous springs, 'Grande-Grille,' 'L'Hôpital,' 'Celestins,' 'Hauterive,' 'Saint Yorre.' They contain from 70 to 80 grains in 20 oz., chiefly Sodium Bicarbonate from 35 to 45 grains, with Sodium Chloride and other salts. Used in kidney diseases, diabetes, gouty, hepatic and urinary diseases. For drinking and bathing. May to October. Imported (Pastilles, Salts and Water).

VILLACABRAS (Spain).—Aperient Water, contains chiefly Sodium Sulphate.

VITTEL (Vosges, France).—Calcareous springs resembling those of Contrexéville. May to September. Imported.

WEILBACH (Nassau, Germany).—Two springs, 'Schwefelquelle' and 'Natronlithionquelle.' The first, a sulphur Water, contains about 14 grains total solids in 20 oz., with Sulphuretted Hydrogen. The other about 25 grains in 20 oz., chiefly Sodium Chloride and Bicarbonate, with a small quantity of Lithium Bicarbonate. For hæmorrhoids, gout, rheumatism and urinary complaints. Imported.

WIESBADEN (Nassau, Germany).—Several springs, the principal being 'Kochbrunnen.' Saline. Thermal. 100° to 156° F. (37·7° to 69° C.). About 79 grains in 20 oz., chiefly Sodium Chloride (about 65 grains), with Calcium and Magnesium Chlorides. In chronic gout and rheumatism, catarrh of larynx and bronchitis. 'Wiesbadener Gichtwasser,' a preparation made from Kochbrunnen with the addition of about 70 grains Sodium Bicarbonate in 20 oz. Imported.

WILDBAD (Wurtemberg).—Thermal. Temp. 91·5° to 104·5° F. (33° to 40° C.). Numerous springs. About 4 grains in 20 oz., chiefly Sodium Chloride. Baths are used in chronic rheumatism and gout and paraplegic paralysis of lower extremities. June to September.

WILDUNGEN (Waldeck, Germany).—Several springs. Principal are 'Helenenquelle' and 'Georg-Victor-quelle,' containing varying quantities of minerals, chiefly Calcium, Magnesium and Sodium Bicarbonates. Used in cystitis, pyelitis, renal and vesical disorders.

WITTEKIND (Halle, Saxony).—Saline Water for drinking, containing about 3½ p.c. salt. Also mixed with mother lye for baths.

CLASSIFICATION OF MINERAL WATERS.

Comparatively Free from Salts.

Buxton.
Evian-les-Bains.
Gastein.
Malvern.
Schlangenbad.
Thonon.
Wildbad.

Saline.

Achselmannstein.
Adelheidsquelle.
Aix-la-Chapelle.
Arnstadt.
Baden.
Baden-Baden.
Bath.
Battaglia.
Bonifacius.
Bonnes.
Borcette, or Burtscheid.
Brides-les-Bains.
Buda, or Ofen.
Carlsbad.
Droitwich.
Hall.
Homburg.
Ischia.
Ischl.
Kissingen.
Kosen.
Kœnigsdorf-Jastrzemb.
Krankenheil.
Kreuznach.
Leamington.
Llangammarch.
Mergentheim.
Mondorf.
Nauheim.
Pyrmont.
Reichenhall.
Salies-de-Béarn.
Salins-les-Bains.
Saratoga.
Selters.
Soden.
Spa.
Wiesbaden.
Wittekind.
Woodhall.

Bitter Saline.

Aesculap.
Apenta.
Arabella.
Birmenstorf.
Buda-Pesth.
Carabana.
Condal.
Franz Josef.
Friedrichshall.
Hunyadi.
Marienbad.
Mergentheim.
Pullna.
Rubinat.
Seidlitz.
Villacabras.

Alkaline, and Gaseous Alkaline.

Bellthal.
Bilin.
Birresborn.
Bussang.
Châtel-Guyon.
Ems.
Fachingen.
Franzensbad.
Ischia.
Jodbad Lipik.
Johannis.
Krondorf.
Kronenquelle.
Luhatschowitz.
Marcols.
Marienbad.
Obersalzbrunn.
Roisdorf.
Rosbach.
Royat.
Saint Galmier.
Salvator.
Selters.
Tchitli.
Toëplitz.
Vals.
Vichy.
Wildungen.

Alkaline and Calcareous.

Bethesda.
Buffalo Lithia.
Capvern.
Contrexéville.
Fiuggi.
Lippspringe.
Lucca
Poland.
Pougues.
Vittel.

Arsenical.

Bourboule.
Brides-les-Bains.
Bussang.
Guber.
Levico.
Mont Doré.
Vals.

Chalybeate.

Alet.
Alexanderbad.
Alexisbad.
Auteuil.
Berka.
Bocklet.
Brides-les-Bains.
Bruckenau.
Brucourt.
Bussang.
Charlottenbrunnen.
Driburg.
Flitwick.
Franzensbad.
Godesberg.
Griesbach.
Guber.
Harrogate.
Llandrindod.
Orezza.
Pyrmont.
Recoaro.
Rippoldsau.
Saint Moritz.
Schwalbach.
Soden.
Spa.
Tarasp.

Sulphurous.

Aix-la-Chapelle.
Aix-les-Bains.
Allevard.
Baden.
Bagnères-de-Luchon.
Barèges.
Berka.
Bonnes.
Cauterets.
Challes.
Eilsen.
Enghien.
Harrogate.
Labassère.
Llandrindod.
Landeck.
Meinberg.
Nenndorf.
Saint Boès.
Strathpeffer.
Schinznach.
Vernet.
Weilbach.

Lithiated.

Baden-Baden.
Bonifacius.
Buffalo Lithia.
Franzensbad.
Kissingen.
Kronenquelle.
Obersalzbrunn.
Weilbach.

Thermal Springs.

Aix-la-Chapelle, 113° to 133° F. (45° to 56° C.).
Baden-Baden, 124° to 150° F. (51·1° to 65·5° C.).
Bagnères-de-Luchon, 61° to 152° F. (16·1° to 66·6° C.).
Barèges, 81° to 111° F. (27·2° to 43·8° C.).
Bath, 88° to 120° F. (31·1° to 48·8° C.).
Battaglia, 136° to 160° F. (57·7° to 71·1° C.).
Bonnes, 72° to 90·5° F. (22·2° to 32·2° C.).
Buda, or Ofen, 141·5° F. (61° C.).
Buxton, 82° F. (27·7° C.).
Capvern, 70° to 76° F. (21·1° to 24·4° C.).
Carlsbad, 'Sprudel,' 162° F. (72·2° C.).
Cauterets, 103° to 128° F. (39·4° to 53·3° C.).
Dax, 88° to 140° F. (31° to 60° C.).
Ems, 80° to 120° F. (26·6° to 48·8° C.).
Gastein, 78° to 121° F. (26° to 49·4° C.).
Ischia, 131° to 149° F. (55° to 65° C.).
Jodbad Lipik, 147° F. (63·8° C.).
Landeck, 66° to 84° F. (18·8° to 29° C.).
Leuk, or Loèche-les-Bains, 102° to 124° F. (48·8° to 51·1° C.).
Lucca, 98° to 129° F. (36·6° to 53·8° C.).
Mondorf, 77° F. (25° C.).
Mont Doré, up to 113° F. (45° C.).
Nauheim, 82° to 95·5° F. (27·7° to 35° C.).
Plombières, 77° to 155° F. (25° to 68·3° C.).
Ragatz Pfaffers, 98° F. (36·6° C.).
Royat, 68° to 95° F. (20° to 35° C.).
Saint Gervais, 102° to 108° F. (38·8° to 42·2° C.).
Schinznach, 82·4° to 95° F. (28° to 35° C.).
Schlangenbad, 81·5° to 89° F. (27·2° to 31·6° C.).
Toëplitz, 83° to 114° F. (28·3° to 45·5° C.).
Vernet, 90° to 154° F. (32·2° to 67·7° C.).
Vichy, 57° to 106° F. (13·8° to 41·1° C.).
Wiesbaden, 100° to 156° F. (37·7° to 69° C.).

Wildbad, 91·5° to 104° F. (33° to 40° C.).

Table Waters.

Apollinaris.
Bellthal.
Bilin.
Birresborn.
Cambrunnen.
Condillac.
Evian-les-Bains.
Fachingen.
Geilnau.
Gerolstein.
Giesshübler.
Johannis.
Krondorf.
Kronthal.
Malvern.
Marcols.
Renaison.
Rhens.
Roisdorf.
Rosbach.
Saint Galmier.
Selters.
Taunus.
Thonon.

SECTION A.

THERAPEUTICAL CLASSIFICATION OF REMEDIES.

Alteratives.—Medicines which gradually change and correct a morbid condition of the organs, so that abnormal conditions become normal and metabolism is increased.
Ammonium.—Ammonii Chloridum.
Antimony.—Antimonii Oxidum, A. Sulphuratum, A. Tartaratum.
Arsenic.—Acidum Arseniosum, Injectio Ferri Arsenatis, Liquor Arsenicalis, Liquor Arsenici Hydrochloricus, Liquor Sodii Arsenatis, Sodii Cacodylas.
Calcium.—Calcii Chloridum, Calcii Hypophosphis, Calcii Sulphidum.
Iodine and the Iodides.
Iron Salts.
Mercury.—Hydrarg. c. Cretâ, Pilula Hydrarg., Hydrarg. Perchloridum and Subchloridum, Hydrarg. Iodidum Rubrum.
Phosphorus and the Hypophosphites.
Potassium Salts.
Sulphur.—Præcipitatum, Sublimatum and Sulphides.
Vegetable.—Caffeina, Coca, Dulcamara, Guaiacum, Hemidesmus, Mezereum, Sarsaparilla, Sassafras, Taraxacum.
Eclectics.—Iridin, Leptandrin, Phytolaccin, Podophyllin.

Anæsthetics.—They are divided into *General* (by inhalation) and *Local* (by spray or other application to the part). GENERAL ANÆSTHETICS abolish consciousness and reflex action, and so prevent the perception of painful and other stimuli in the sensory centres: Æther, Æther Methylatus (sp. gr. 0·717), Æthyl Bromidum, Æthyl Iodidum, A.C.E. Mixture, Carbon Tetrachloride, Chloræthoform, Chloroform, Kelene, Methylene, Narcotile, Nitrous Oxide Gas, Pental, Regnauld's Anæsthetic Mixture, Soemnoform. LOCAL ANÆSTHETICS prevent the reception of stimuli by the peripheral terminations of sensory nerves: Acid. Carbolic., Acoine, Æther (spray), Æther Methylatus (sp. gr. 0·717), Æther Methylicus, Æthoxycaffeinum, Æthyl Bromidum, Æthyl Chloridum, Alypin, Anæsthesin, Anæsthyl, Aromatic Oils, Benzoyl-pseudotropine (Tropacocaine), Chloretone, Cocainæ Hydrochloridum, Cocainæ Phenylas, Coryl, Erythrophlæinæ Hydrochloridum, Eucaine Hydrochloride (A) and (B), Euguform, Guaiacol, Guaiacyl, Holocaine Hydrochloride, Ice, Iodoform, Kelene, Menthol, Methyl Chloridum, Methylal, Nervocidine, Nirvanin, Novocaine, Orthoform, Orthoform New, Phenol Camphor, Stovaine, Subcutin, Tropacocaine, Thymol, Yohimbine.

Analgesics or Anodynes.—Medicines which alleviate pain by lessening the excitability of nerves or nerve centres: Abrastol, Acetanilidum, Acid. Carbolic., Aconitum, Aconitina, Æthyl Chloridum, Agathin, Ammonol, Amyl Nitris, Antikamnia, Antipyrine, Antisepsin, Antitoxine, Apolysin, Aristochin, Asaprol, Atropina, Belladonna, Bromides, Brucine, Butyl-Chloral Hydras, Caffeina, Cajuputi and Caryophylli Ol., Camphor, Cannabis Indica, Chloral Hydras, Chloroform, Cimicifuga, Citrophen, Cocainæ Phenylas, Codeina, Codeinæ Iodas, Conina, Conium, Creosotum, Dionine, Euquinine, Exalgin, Gelsemium, Hyoscyamus, Ipecac. Pulvis Compositus, Kryofin, Lactophenin, Lupulus, Malakin, Methylene Blue, Morphina, Opium, Orthoform, Papaver, Phenacetin, Phenalgin, Phenyl-urethane (Euphorin), Piscidia, Pyramidon, Quinina, Salipyrin, Salophen, Saloquinine, Scopola, Solanine, Spiritus Ætheris, Tolypyrin, Tolysal, Veratrina.

Anaphrodisiacs.—Medicines which diminish the sexual passion: Ammonii Bromidum, Belladonna, Camphora, Conium, Digitalis, Hyoscyamus, Lupulinum, Potassii Bromidum, Potassii Iodidum, Sodii Bromidum, Sodii Iodidum, Stramonium, Tabacum; also alkalis, hypnotics, depressants.

Anhidrotics.—Medicines which check perspiration: Acid. Acetic., Acid. Camphoric, Acid. Phosp. Dil., A. Salicylic., A. Sulphuric. Dilut., A. Tannic., Agaricus, Agaricin, Atropina, Belladonna, Cotoin, Ergot, Ferri Sulphas, Ferri Mist. Comp., Guaiacol Camphorate, Hæmatoxyli Decoct., Hyoscyamus, Paraphenetidin Camphorate, Pyramidon Mono- and Bi-Camphorate, Picrotoxinum, Quinina, Scopola, Stramonium, Strychnina, Zinci Oxidum.

Antacids.—Agents which reduce the acidity of the gastric contents: Ammonia, Ammon. Spirit. Aromatic., A. Carbonas, Bismuthi Trochiscus, Calcii Hydras, C. Carbonas Præcipitatus, Calcis Liquor, C. Saccharatus Liquor, Creta Præparata, Lithii Carbonas, Lithii Citras, Magnesia, M. Carbonas, Potassæ Liquor, P. Bicarbonas, P. Carbonas, Pot. Citras, Pot. Tartras, Sapo Durus, Sodii Bicarbonas, Sodii Phosphas.

Mineral Waters.—Contrexéville, Ems, Fachingen, Tarasp, Vichy.

Anthelmintics.—Medicines which destroy intestinal worms (Vermicides), or expel them from the alimentary canal (Vermifuges).

VERMICIDES: *Ascarides or Thread Worms.*—Acid. Carbolic., Areca, Arecoline Hydrobromide; Enema—Aceti, Eucalyptus Oil, Ferri Perchloridi, F. Sulphatis, Olivæ Olei, Quassiæ, Ol. Ricini and Terebinthinæ; Santoninum, Sodii Chloridi.

Round Worm.—Areca, Santoninum.

Tape Worm.—Acid. Embelicum, Ammonii Embelas, Cusso, Embelia Ribes, Eucalyptus Oil, Extractum Filicis Liquidum, Granati Cort., Kamala, Pelletierinæ Sulphas and Tannas, Terebinthinæ Oleum.

VERMIFUGES: Areca, Butea, Calomel, Cambogia, Jalapa, Kamala, Nucis Juglandis Spiritus, Ricini Oleum, Scammonium, Thymol Carbonate.

Antidotes are mentioned under the several poisonous drugs.

Antilithics.—Medicines which counteract lithiasis or lithæmia, *i.e.*, a tendency to the deposit of uric acid or urates, or to the formation of the corresponding Calculi: Acid. Nitric. Dil., Acid. Phosph. Dil., Cystamine, Hexamethylenetetramine, Hydrarg. Pil., Lithium salts (*see* p. 733), Magnesia, Mag. Carbonas, Magnes. Liq. Efferv., Piperazine, Piperazine Quinate, Piperidine Tartrate Acid, Podophyllin, Potassii Acetas, Potassii Bicarb., Sapo Durus, Soda Tartarata, Sodii Benzoas, Sodii Bicarb., Sodii Citro-tart. Efferv., Sodii Phosphas, Urea, Uresin, Urol, Urotropine; diuretics, saline purgatives.

Mineral Waters.—Carlsbad, Friedrichshall, Hunyadi-Janos, Mergentheim, Neuenahr, Selters, Tchitli, Vals, Vichy, Wildungen.

Antiperiodics.—Medicines which have the property of preventing the periodical attacks of certain fevers: Acid. Arsenios., Bebeerinæ Sulph., Berberis, Cinchona, Cinchonidine Salicylate, Cusparia, Ferri Arsenio-Citras Ammoniata, Ferri Arsenatis Inj., Narcotina, Nectandræ Cort., Quinine Salts, Picrorhiza, Salicin.

Antipyretics.—Medicines which reduce and control the temperature in fever: Abrastol, Acetanilidum, Acetopyrin, Acids, Acid. Acetyl-salicylic, Acid. Anisic, Acid. Salicylic., Aconitum, Ammon. Benz., Ammonii Salicylas, Ammonol, Ammonol Bromide, Lithiated and Salicylate, Antikamnia, Antipyrine Camphorate, Antisepsin, Antitoxine, Antimonium Tartaratum, Apolysin, Aristochin, Asaprol, Aspirin, Bromopyrin, Camphor Salicylate, Chinaphenin, Citrophen, Eupyrine, Euquinine, Hydracetin, Iodopyrin, Kryofin, Lactophenin, Malakin, Magnesii Benzoas, Migrainine, Paracresotinic Acid, Paraphenetidin Agarate and Camphorate, Phenalgin, Phenosal, Phenacetin, Phenazonum, Phenocoll Hydrochloridum, Phesin, Piperina, Potassii Citras, Pyramidon, Pyramidon Mono- and Bi-Camphorate and Salicylate, Pyrantin, Pyrodin, Quebracho, Quinina, Resorcin, Salicin, Salol, Salophen, Saloquinine, Sodii Anisas, Sodii Di-Thiosalicylas, Sodii Paracresotinas, Sodii Salicylas, Sodii Sulphocarbolas, Spirit. Æther. Muriaticus, Spirit. Æther. Nitrosi, Spirit. Rectificatus, Thallinæ Sulphas, Tolypyrin, Tolysal, Triphenine.

Antiseptics.—Agents which prevent decomposition by inhibiting the growth of Micro-organisms: Acid. Benzoicum, Acid. Boricum, Acid. Carbolicum, Acid. Chromicum, Acid. Cinnamic, Acid. Cresotinicum, Acid. Cresylicum, Acid. Hydrochloricum, Acid. Nitricum, Acid. Oxynaphthoicum, Acid. Pyrogallicum, Acid. Pyroligneosum Crudum, Acid. Salicylicum, Acid. Sulphocarbolicum, Acid. Sulphurosum, Acid. Trichloraceticum, Albargin, Aluminii Acetatis Liquor, Alum. Aceto-Tartras, Actol, Alum. Chloridi Liquor, A. Oleas, A. Nitras, A. Sulphas, Alumnol, Ammon. Benzoas, Amyloform, Antiseptin, Antinosin, Anytin, Anytol, Argentamin, Argentol, Argonin, Aristol, Aseptin, Asterol, Balsamum Peruvianum and Tolutanum, Benzoin, Benzonaphthol, Benzoyl Peroxide, Betol, Bismone, Bismuthi Benzoas, B. Betanaphtholas, B. Cerii Salicylas, B. Cinchonidinæ Iodidum, B. Di-thio-salicylas, B. Iodo-resorcin Sulphonas, B. Oleas, B. Oxychloridum, B. Oxyiodogallas, B. Phenol, B. Phosphas, B. Quinolinæ Sulphocyanidum, B. Salicylas, B. Subgallas, B. Subiodas, B. Sulphis, B. Tribromphenolas, Borax, Boro-Glyceride, Branalcane, Calcii Iodas, Calcii Paracresotinas, Calcinol, Calx Chlorinata, Carbo Ligni, Camphor, Camphor Phenol, C. Resorcin, C. Salicylate, C. Thymol, Carbonis Bisulphidum, Caryophyllum, Chinoline, Chinolinæ Tartras, Chinosol, Chlori Liquor, Chloroform, Cinchoninæ Iodo-Sulphas, Cinchonidinæ Sulphocarbolas, Cinnamomum, Cinnamomi Ol., Collargol, Copaiba, Creosotum, Cupri Oleas, C. Sulphocarbolas, Cyllin, Cystamine, Dextroform, Diaphtherin, Diaphthol, Di-iodoform, Eau de Javelle, α-Eigon, Eka-Iodoform, Eucalyptol, Eucalyptus Oil, Eudoxin, Eugallol, Euguform, Eupyrin, Europhen, Fel Bovinum Purif., Fluoroform, Formaldehyde, Formicin, Fortoin, Glacialine, Glutol, Glycerinum, Glycosal, Guaiacol and its salts, Guaiaquin, Guaiamar, Guaiasanol, Helenin, Hermophenyl, Hexamethylenetetramine, Hydrargyri Cyanidum, H. Ethylene-diamine Citras, H. et Potassii Iodidum, H. Nitratis Liquor Acidus, H. Nucleinas, H. Perchloridum, H. Salicylas, H. Subchloridum, Hydrarg. Zinco-Cyanid., Hydrargyrol, Hydrogenii Peroxidi Liquor, Hydronaphthol, Ichthargan, Ichthoform, Iodi Tribromidum, Iodi Trichloridum, Iodofan, Iodoformin, Iodoformogen, Iodoformum, Iodol, Iodolene, Iodopyrin, Iodum, Itrol, Izal, Lactonaphthol, Lenigallol, Listerine, Loretin, Losophan, Lysoform, Lysol, Menthol, Menthosol, Menthoxol, Mercuramine, Metakalin, Methyl Salicylas, Microcidine, Naphthalene, Naphthol, Naphthol-Camphor, Nosophen, Nuclein and its salts, Orthoform, Para-monochlorphenol, Phenosalyl, Potassa Sulphurata, Potassii Permanganas, Protargol, Pyoktanin, Quinaphthol, Quininæ Hydrochlor., Quininæ Sulphas, Resorcin, Resorcinol, Sal Alembroth, Saligallol, Salitannol, Salol, Saloquinine, Saprol, Sanoform, Sodæ Chlorinatæ Liquor, Sodii Anisas, S. Benzoas, S. Chloridum, Sodii Di-Thiosalicylas, S. Fluoridum, S. Salicylas, S. Silicofluoridum, S. Sulphis, S. Sulphocarbolas, Solveol, Sozoiodol, Strontii Salicylas, Sulphaminol, Tachiol, Terebinthinæ Oleum, Thalleinæ Sulphas, Thymol, Traumatol, Tribromphenol, Tribromoresorcin, Trichlorphenol, Trikresol, Vioform, Yeast, Zinci Chloridum, Zinci Sulphis, Zinci Sulphocarbolas, Zymocide.

Antispasmodics.—Medicines which allay or prevent the recurrence of spasms: Acid. Hydrocyanic. Dil., Æther, Æther Aceticus, Æthyl Iodidum, Ammoniæ Liquor, A. Carbonas and Bicarbonas, Spiritus Ammoniæ Aromaticus, Ammoniacum, Amyl Nitris, Amyl Valerianas, Antim. Tartaratum, Argenti Nitras, Argenti Oxidum, Asafetida, Atropinæ Valerianas, Belladonna, Boldo, Bromides, Cajuput. Ol., Calendula, Camphora, Camphora Monobromata, Cannabis Indica, Caryophyllum, Castoreum, Cerii Oxalas, Chloral Hydras, Chloroformum, Cimicifuga, Conium, Ethyl Nitritis Liquor, Euphorbia Pilulifera, Galbanum, Grindelia, Hyoscyamus, Iso-butyl Nitrite, Juniperi Ol., Lobelia, Menth. Pip. Ol., Moschus, Opium, Physostigma, Physostigminæ Salicylas and Sulphas, Pil. Aloes et Asafetidæ, Piscidia, Quebracho, Rutæ Oleum, Santonin, Sodii Nitris, Spir. Ammon. Fetid., Stramonium, Sumbul, Tabacum, Terebinthina, Trinitrini Liquor and Tabellæ, Valeriana and Valerianates, Zinci Oxidum, Zinci Sulphas, Zinci Valerianas.

Aperients.—*See* Cathartics.

Aphrodisiacs.—Medicines which increase sexual appetite: Alcohol, Belladonna, Calcii Hypophosphis, Camphor, Cantharis, Coffee, Damiana, Tinct. Ferri Perchlor., Hæmatinics and Nux Vomica (Strychnina), Phosphorus, Tonics, **Yohimbine.**

Aromatics.—*See* Carminatives.

Astringents.—Medicines which produce contraction of the tissues, diminution in the size of blood-vessels and coagulation of the albuminous fluids; they are given to improve digestion and check secretions, mucous discharges, and hæmorrhages; or applied topically to stop bleeding and diminish discharges.

Mineral Substances.—All the Diluted Mineral Acids, Aluminium Salts, Argentamin, Argenti Nitras, A. Oxidum, Bismuth salts, Borax, Cadmii Sulphas, Calamina, Calcii Carbonas Præcip., Calcii Hydras, Carbolic Acid, Creosotum, Creta Præp., Cupri Sulphas, Ferri Perchlor. Liquor, F. Pernit. Liquor, F. Sulphas, Ferri et Quin. Cit., Plumbi Acetas, P. Carbonas, P. Oxidum, P. Subacetatis Liquor Fortis, Zinci Acetas, Z. Carbonas, Z. Chloridum, Z. Oxidum, Z. Sulphas, Z. Sulphocarbolas.

Vegetable Substances.—Acetum, Acid. Acetic. Dil., A. Gallic., A. Tannic., Areca, Belæ Confectio, Catechu, Cinchona, Cinnamomum, Coto, Ergota, Erigerontis Oleum, Filix Mas, Galla, Gallogen, Glutanol, Granati Cort., Guarana, Gummi Eucalypt., Hæmatoxylum, Hamamelis, Honthin, Hydrastis, Ispaghula, Krameria, Kino, Larix, Matico, Myrobalans, Nucis Juglandis Spiritus, Opium, Quercus, Rheum, Rosæ Gallicæ Petala, Symphytum, Tannalbin, Tannigen, Tannoform, Tanocol, Tannone, Terebinthinæ Ol., Ulmus, Uva Ursi, Vinca Major.

Carminatives.—Medicines which stimulate or aid the removal of flatus from the stomach and intestines, and relieve griping: Æther, Æther Aceticus, Anethi Ol., Anisi Ol., Asafetida, Boldo, Camphor, Carbo Ligni, Cardamomum, Carui Ol., Caryoph., Cascarilla, Chloroformum, Cinnamomum, Coriander, Coto, Fœniculum, Ipecacuanha, Juniper, Lavand. Ol., Limon. Ol., Menth. Pip. Ol., Menth. Virid. Ol., Menthol, Menthol Valerianate, Myristica, Myrrha, Pimento, Piper, Rosmarini Oleum, Sumbul, Valeriana, Zingiber.

Cathartics.—Medicines which promote intestinal evacuations.

Aperient or Laxative.—Amygdalæ Oleum, Apocodeinæ Hydrochloridum, Asafetida, Baptisin, Belladonna, Cascara Sagrada, Cassiæ Pulpa, Euonymin, Fel Bovinum, Ficus, Glycyrrh. Pulv. Comp., Ipecac., Juglans, Lactuca, Lini Oleum, Magnesia, M. Carbonas, M. Citratis Liquor, Manna, Mel Depuratum, Menyanthes, Mori Succus, Nux Vomica, Olivæ Oleum, Phenolphthalein, Potassii Sulphas, P. Tartras, Prunum, Rhamnus, Ricini Oleum, Sapo Durus, Sodii Citro-tartras Effervescens, Sodii Phosphas, Sodii Sulphas, Sodii Sulphovinas, Soda Tartarata, Sulphur, Sulphur Præcip., Tamarindus, Taraxacum.

Purgative.—Acid. Cathartic., Aloes Barb., A. Socot., Aloin, Baptisin, Colchicum, Convallarin, Helleborus Niger, Hydrarg. Subchloridum, Iris, Iridin, Juglans, Kamala, Leptandrin, Magnes. Sulphas, Mangan. Sulphas, Phytolacca, Podophyllin, Purgatin, Rheum, Senna, Sodii Chloridum, Sodii Sulphas.

Drastic or Hydragogue.—Apocynum, Bryonia, Cambogia, Colocynthis, Crotonis Oleum, Elaterium, Elaterinum, Helleborus Niger, Hydrarg. c. Creta, Hydrarg. Subchloridum, Jalapa, Kaladana, Lobelia, Magnes. Sulphas, Potass. Tart. Acidus, Scammonium, Sodii Sulphas, Veratrina.

Mineral Waters.—Achselmannstein, Birmenstorf, Carlsbad, Friedrichshall, Homburg, Hunyadi-Janos, Kissingen, Marienbad, Pullna, Royal Hungarian Bitter Water (Buda-Pesth), Seidlitz.

Caustics.—Substances which destroy the vitality of the parts to which they are applied: Acid. Acetic. Glaciale, A. Arseniosum, A. Carbolicum, A. Chromicum, A. Hydrochloricum, A. Nitricum, A. Pyrogallic., A. Sulphurici Pasta, A. Trichloracetic, Alum. Exsiccatum, Aluminium Aceto-Tart., Antim. Chloridi Liquor, Argenti Nitras, Calx, Creosotum, Cupri Acetas, C. Nitras, C. Subacetas, C. Sulphas, Ferri Pernitratis Liquor, Formaldehyde, Hydr. Iod. Rubr., Hydr. Nitrat. Acidus Liquor, Hydr. Ox. Rubr., Hydr. Ox. Flav., Hydr. Perchloridum, Potassa Caustica, Potassa c. Calce, Potassii Permang., Sodii Ethylatis Liquor, Zinci Chloridum, Zinci Nitras.

Cholagogues.—The *direct* increase the amount of bile secreted: Acid. Hydrochlor. Dil., Acid. Nitric. Dil., Acid. Nitro-hydrochlor. Dil., Aloes, Ammonii Chloridum, Ammonii Phosphas, Antim. Sulphuratum, Boldo, Colchicum, Colocynth, Eunatrol, Euonymus, Fel Bovinum Purif., Hydrastis, Ipecacuanha, Iridin, Jalapa, Phytolaccin, Podophyllin, Rheum, Sodii Benzoas, Glycocholas, Salicylas, and Sulphas. The *indirect* act by stimulating the duodenum: Mercury, especially the Subchloride; most Cathartics.

Mineral Waters.—Ems, Friedrichshall, Hungarian, Hunyadi-Janos, Kissingen.

Counter-Irritants.—Substances which stimulate and cause irritation or inflammation of the parts to which they are applied; they differ in their intensity of action, and may be divided as follows:—

Rubefacients.—Agents which, when applied to the skin, produce local warmth and redness: Acid. Aceticum, Æther, Alcohol, Ammoniæ Liquor, Ammoniacum, Armoracia, Emp. Calefaciens, Cantharis, Iodum, Lin. Camphoræ Ammon., Lin. Capsici, Lin. Chloroformi, Lin. Sinapis, Liq. Iodi Fortis, Mentholi Emp., Mezereum, Ol. Cadinum, Ol. Cajuputi, Ol. Limonis, Ol. Rosmarini, Ol. Rutæ, Ol. Succini, Ol. Terebinth., Picis Emp., Thymol, Ung. Elemi.

Vesicants or Epispastics.—Those which raise a vesicle or blister: Acidum Aceticum Glaciale, Ammoniæ Liquor Fortior, Cantharidin, Cantharis Emp., Epispasticus Liquor, Euphorbium, Mezerei Ung., Rutæ Oleum, Sinapis Lin., Sinapis Oleum.

Pustulants.—Those which produce pustules: Antimonium Tartaratum, Argenti Nitras, Crotonis Oleum.

Demulcents.—Substances which protect, and thus allay irritation of, the mucous membranes: Acaciæ Gum., Althæa, Amygdala Dulc. and Oleum, Amylum, Carrageen, Cetraria, Cydonium, Cynoglossum, Ficus, Gelatinum, Glycerinum Boracis, Glycyrrhiza, Hordeum, Ichthyocolla, Ispaghula, Linum, Maranta, Mel Depuratum, Olivæ Oleum, Ovi Albumen, Prunum, Sacch. Purificatum, Salep, Sevum, Theriaca, Tragacantha, Triticum Repens, Ulmus, Uvæ.

Deodorants.—Substances which destroy offensive odours and absorb foul gases: Chlorine and its oxides, Acid. Chromic., Acid. Nitric., Acid. Sulphuros., Bromum, Calx, Calcii Permanganas, Carbo Ligni, Chinosol, Di-iodoform, Eigons (A) and (B), Eka-iodoform, Eucalypti Ol., Europhen, Ferri Sulph., Formaldehyde, Hydrogenii Peroxidum, Iodoformin, Iodoformogen, Iodoformum, Iodol, Iodolene, Iodum, Loretin, Menthoxol, Napthalene, Nosophen, Paraformaldehyde, Plumbi Nitras, Potass. Permang., Resorcinol, Thymol, Trichlorphenol, Vioform, Zinci Chloridum.

Depilatories.—Chemicals which destroy living hair: Barii Sulphid., Calx Sulphurat., X Rays.

Desiccants.—Agents which check secretion, and allay discharges from ulcers and wounds: Acidi Borici Pulvis, Bismuthi Subnit., Calamina, Calcii Carbonas Præcip., Calcii Hydras, Creta Præparata, Magnesii Carbonas, Plumbi Acetas, Plumbi Carbonas, Talc, Zinci Carbonas and Oxidum.

Diaphoretics.—Medicines which increase the action of the skin and induce perspiration: Acidum Salicylicum, Aconitum, Æther, Alcohol, Ammonii Acetatis Liquor, Ammon. Carbonas, Ammon. Chlorid., Ammon. Citratis Liquor, Ammon. Phosphas, Antimonialis Pulvis, Antim. Vinum, Antim. Sulphurat., Arecolinæ Hydrobrom., Armoracia, Buchu, Cajuputi Sp. and Oleum, Calendula, Camphor, Chinosol, Chloroform, Colchici Vin., Doveri Pulv., Dulcamara, Eupatorium, Grindelia, Guaiaci Ammon. Tinct., Ipecac. Pulv. Comp., Ipecac. Vin., Jaborandi, Lactuca, Lobelia, Mezereum, Morphina, Opium, Pilocarpina, Pilocarpine Hydrochloride, Nitrate and Salicylate, Potassii Acetas, Potassii Citras, Potass. Nitras, Salicin, Sassafras, Senega, Serpentaria, Simaruba, Sodii Salicylas, Sp. Ætheris Nit., Spiritus Camphoræ, Spiritus Rectificatus, Sulphur, Sulphur Præcip., Terebinthinæ Oleum.

Disinfectants.—Substances which destroy the specific microbes or toxins of communicable diseases: Acid. Carbol., Acid. Chromic., Acid. Cresylic., Acid. Nitrosum, Acid. Pyrogallic., Acid. Sulphurosum, Aluminii Chloridi Liquor, Benzonaphthol, Bromum, Calx Chlorinata, Calcis Chlorinata Liquor, Calcii Cresotinas, Calcii Permanganas, Carbol-Lysoform, Chinosol, Chloralum, Chlorine, Creosotum, Cyllin, Ferri Sulphas, Formaldehyde, Galloformin, Hydrarg. Perchlor., Hydrogenii Peroxidum, Iodoformum, Iodol, Iodum, Iodi Tribromidum and Trichloridum, Lysoform, Naphthol, Paraformic Aldehyde, Potassii Permang., Condy's Fluid, Potassii Bichrom., Pini Oleum, Salacetol, Salol, Sodæ Chlorinatæ Liquor, Sodii Permang., Solutol, Sublamin, Terebenum, Thymol, Zinci Chloridum.

Diuretics.—Medicines which promote the secretion of urine: Acid. Benzoic., Acid. Camphoric, A. Chinic., Acid. Formic, Acid. Phosph. Dil., Aconitum, Æthoxycaffeinum, Agurin, Alcohol, Ammon. Acet. Liq., Ammon. Benzoas, Ammon. Boras, Ammon. Chlorid., Apocynum, Armoracia, Belladonna, Boldo, Borax, Buchu, Caffeina, Caffeinæ Sodio-Benzoas, Caff. Sodio-Salicylas, Cambogia, Cantharis, Caulophyllin, Chinotropine, Colchicum, Convallaria, Copaiba, Copaibæ Resin, Cubeba, Damiana, Digitalis, Diuretin, Dulcamara, Emblica, Erigerontis Ol., Euonymin, Helmitol, Hemidesmi Radix, Hexamethylenetetramine, Hydrarg. Subchloridum, Hyoscyamus, Iridin, Juniperi Oleum, Kava-Kava, Lactuca, Lithii Liquor Carbonatis, Lithii Carbonas, Lithii Citras, Lithium Theobromine Salicylate, Lobelia, Lysidine, Lysidine Acid Tartrate, Magnesia, Mag. Carbonas, Nitrites, Oxysparteine, Oxysparteine Hydrochloride and Sulphate, Paraldehyde, Pareira, Physalis, Pix Liquida, Potassii Acetas, Potass. Iodide, Potassii Nitras, Potassii Tartras Acida, Potassii Tartras, Potassii Bicarb., Potassii Carb., Potassii Citras, Sacchar. Lactis, Salicylates, Senega, Scoparium, Scilla, Simaruba, Soda Tartarata, Sodii Acetas, Sodii Benzoas, Sodii Bicarb., Sodii Phosphas, Sparteinæ Periodidum et Sulphas, Spirit. Ætheris Nit., Spir. Rectificatus, Strontii Lactas, Terebinthinæ Ol., Theobromine, Theocin, Triticum, Ulexine, Ulmi Decoctum, Urea, Uresin, Urocitralis, Uvæ Ursi.

Mineral Waters.—Friedrichshall, Kissingen, Leuk.

Ecbolics.—Substances which promote the contraction of the gravid uterus and facilitate the expulsion of the contents: Borax, Cimicifuga, Cornutinæ Citras, Drastic Purgatives, Ergota, Hydrastinæ Hydrochloridum, Quinina, Ruta, Sabina.

Emetics.—Medicines which excite vomiting: Alum (in repeated doses), Ammonii Carbonas, Anthemis, Antim. Sulphuratum, Antimonium Tartaratum, Apomorphinæ Hydrochloridum., Baptisin, Calotropis, Cephaeline, Cephaeline Hydrochloride, Cupri Sulphas, Emetine, Emetine Hydrobromide and Hydrochloride, Ipecacuanha, Lukewarm or Tepid Water, Phytolacca, Sinapis Pulvis, Sodii Chloridum, Tabacum, Veratrina, Veratrum Viride, Zinci Acetas, Zinci Sulphas.

Emmenagogues.—Medicines which maintain or restore a healthy condition of the menstrual discharge: Alcohol, Aloes, Aloes Decoctum Co., Aloes et Myrrhæ Pil., Apiol, Borax, Calendula, Cantharis, Caulophyllin, Cimicifuga, Ergota, Ferrum Redactum, Hæmatinics, Helleborus Niger, Hydrastininæ Hydrochloridum, Iron salts, Manganesii Oxid. Præp., Myrrha, Potass. Permang., Purgatives, Quinina, Ruta, Sabina; Nervine Tonics.

Emollients.—Substances which soften and relax the tissues, also such as protect sensitive surfaces; employed to allay irritation: Adeps, Adeps Lanæ, Amygdalæ Oleum, Glycerinum Boracis, Cera Alba, Cera Flava, Cetaceum, Collodium, Cydonium, Glycerinum Dilutum, Glycer. Amyli, Linum Contusum, Olivæ Oleum, Paraffinum Molle, Sevum, Ulmus.

Epispastics.—*See* Counter-Irritants.

Errhines.—*See* Sternutatories.

Escharotics.—*See* Caustics.

Expectorants.—Medicines which promote the secretion of bronchial mucus or facilitate its expulsion: Acid. Benzoicum, Acidum Carbolicum, Æther, Alkalis, Ammonia, Ammonii Benz., Ammonii Carb., Ammonii Chloridum, Ammoniacum, Anisi Oleum, Antimonium Tartaratum, Apomorphinæ Hydrochlor., Asafetida, Bals. Peruv., Bals. Tolut., Benzoin, Camphora, Cimicifuga, Copaiba, Creosotum, Cubeba, Emetine Hydrobromide and Hydrochloride, Eucalyptus, Galbanum, Glycyrrhiza, Guaiacol and its salts, Iodides, Ipecacuanha, Laricis Cortex, Lobelia, Myrrha, Physostigma, Pini Oleum, Pix Liquida, Quillaia, Scilla, Senega, Styrax Præp., Sulphur, Terpene Hydrate, Terebene, Terebinth. Oleum, Vapores Acidi Carbolici, Chlori, Creosoti, and Iodi, Yerba Santa.

Febrifuges.—*See* Antipyretics.

Galactagogues.—Agents which increase the secretion of the mammary gland: Jaborandi, Potass. Chlorat., and Tonics.

Hæmatinics.—*See* Tonics, Blood.

Hæmostatics.—*See* Styptics.

Hypnotics.—(Soporifics)—Medicines which induce sleep, and thus remove the consciousness of pain by lessening the excitability and functional activity of the brain cells: Acetophenone, Acid. Hydrobrom. Dil., Ammon. Bromidum, Amylene Hydrate, Antispasmin, Apomorph. Hydrochlor., Boldo, Bromural, Camphor, Camphora Monobromata, Cannabinæ Tannas, Cannabinon, Cannabis Ind., Chloral Hydras, Chloralamide, Chloralose, Chloretone, Chlorobrom, Codeina, Conium, Dormiol, Dionine, Hedonal, Heroin, Heroin Hydrochloride, Hyoscyamus, Hyoscina, Hyoscine Hydrobromide, Hydrochloride and Hydriodide, Hypnal, Hypnone, Lactophenin, Lithii Bromidum, Lupulus, Metaldehyde, Methylal, Morphina, Morphinæ Bimeconatis Liquor, Narceina, Neuronal, Opium, Papaver, Papaverina, Paraldehyde, Peronine, Piscidia, Potassii Bromidum, Scopolaminæ Hydrobrom., Sodii Bromidum, Somnal, Stramonium, Sulphonal, Tetronal, Trional, Urethane, Veronal.

Laxatives.—*See* Cathartics.

Mydriatics.—Drugs which produce dilatation of the pupil: Arecoline Hydrobromide, Atropina, Atrop. Methylbrom., Atropine Salicylate, Atroscine, Belladonna, Cocaina, Cocainæ Hydrochloridum, Daturina, Duboisinæ Sulphas, Ephedrine Hydrochloride, Euphthalmine Hydrochloride and Salicylate, Homatropina, Homatropinæ Hydrobromidum, Hydrochloridum and Salicylas, Hyoscyamus, Hyoscinæ Hydrobromidum and Hydrochloridum, Mydrin, Mydriasin, Hyoscyaminæ Hydrobromas and Sulphas, Scopola, Stramonium.

Myotics.—Drugs which contract the pupil: Eserine, Jaborandi, Morphina, Opium, Physostigmina, Physostigminæ Salicylas and Sulphas, Pilocarpina.

Narcotics.—*See* Hypnotics.

Nutritives.—Substances which aid assimilation and improve the condition of the tissues: Acaciæ Gum., Amygdala Dulc., Bynes Extractum, Calcii Glycerophosphas, Carnis Extract., Carrageen, Cetraria Decoctum, Ficus, Hordeum, Manna, Maranta, Mel Depuratum, Morrhuæ Ol., Olivæ Oleum, Prunum, Sacch. Lactis, Sacch. Purificatum, Salep, Sevum, Somatose (various), Sp. Vini Gallici Mist.

Parasiticides.—Medicines which destroy vegetable and animal parasites: Acid. Carbolic., Acid. Pyrogallic., Acid. Salicylic., Acid. Sulphurosum, Anthrarobin, Chrysarobinum, Cupri Oleas, Hydr. Nitrat. Ung., Hydr. Oleas., Hydr. Oxid. Rub. Ung., Hydr. Perchloridum, Iodi Pigmentum, Mercurial preparations, Olea Expressa et Essent., Naphthalene, Picrotoxin, Potassa Sulphurata, Pyrethrum Roseum, Quassia, Sozoiodol, Staphisagria, Styracis Unguentum, Sulphur, Tabacum, Thymol.

Purgatives.—*See* Cathartics.

Pustulants.—*See* Counter-Irritants.

Refrigerants.—Agents which relieve febrile thirst, and impart a feeling of coolness: Acetum, Acidum Aceticum, A. Citricum, A. Hydrochlor. Dil., A. Nitric Dil., A. Phosph. Dil., A. Sulph. Dil., A. Tartaricum, Ammon. Acet. Liquor, Aqua, Aurantii Succus, Imperial Drink, Limonis Succus, Magnesii Citratis Liquor, Mori Syrup., Oxymel, Potass. Citras, Potass. Chloras, Potass. Nitras, Potass. Tart. Acida, Prunum, Sp. Æther. Nitr., Sp. Æther. Muriaticus, Tamarindus. *See* also Diaphoretics and Antipyretics.

Rubefacients.—*See* Counter-Irritants.

Sedatives.—Medicines which exert a soothing influence, by diminishing pain, depressing vital activity, or tranquillising abnormal muscular movement.

Local.—Acid. Carbol., Acid. Hydrocyan. Dil., Atropina, Belladonna, Borax, Chloral, Creosotum, Morphina, Opium, Plumbi Acetas, P. Carbonas, P. Subacetatis Liquor Dilutus. *See* also Anæsthetics (Local), and Anodynes.

Respiratory.—Acid. Hydrocyanic. Dil., Æther, Æther Aceticus, Æthyl Iodidum, Ammon. Bromid., Amyl Nitrite, Belladonna, Cannabis Indica, Chloroformum, Chloral, Codeinæ, Codeine Hydrochloride, Phosphate and Salicylate, Conium, Conina, Coninæ Hydrobrom., Coninæ Hydrochloridum, Dionine, Gelsemium, Heroin, Heroin Hydrochloride, Hyoscyamus, Lactucarium, Laurocerasi Aqua, Lobelia, Morphina and salts, Narcyl, Opium, Peronine, Pruni Virgin. Syrup. et Tinct., Stramonium, Terebinthinæ Oleum.

Nervine.—Acid. Hydrobrom. Dilutum, Ammonii Bromidum, Ammon. Valerianas, Amyl Valerianas, Antim. Tartaratum, Antispasmin, B-Eigon, Bromethylformine, Camphora, Camphora Monobromata, Chloralose, Gallobromol, Gelsemium, Hyoscina, H. Hydrobromidum, Hydrochloridum and Hydriodidum, Hyoscyaminæ Hydrobromidum and Sulphas, Lactuca, Lithii Bromidum, Lupulin, Lupulus, Laurocerasi Aqua, Magnesii Bromidi Liquor, Menthol Valerianate, Neuronal, Niccoli Bromidum, Pareira, Phenacetin, Phenazonum, Physostigma, Piscidia, Potassii Bromidum, Salix Nigra, Scutellaria, Sodii Bromidum, Trional, Valyl, Veratrum Viride, Veronal, Viburnum, Zinci Bromidum.

Gastric.—Acid. Arseniosum, Acid. Carbolic., Acid. Carbonic., Acid. Hydrocyan. Dil., Acid. Phosp. Dil., Ammonii Bromidum, Argenti Nitras, Argenti Oxidum, Belladonna, Bismuth salts, Calcii Hydras, Calcis Liquor, Cerii Oxalas, Chloral, Chlorobrom, Chloroform, Cocainæ Hydrochlor., Cocainæ Phenylas, Creosotum, Hydrarg. c. Creta, Hyd. Subchlor. (small doses), Hyoscyamus, Ice, Ipecacuanha (small doses), Opium, Papaver, Phloridzin, Potass. Bicarb., Potass. Bichrom., Potass. Bromid., Sodii Bicarb., Sodii Bromidum, Zinci Oxidum.

Cardiac.—Acidum Hydrocyanicum Dilutum, Aconitum, Amyl Nitris, Antim. Tart., Apocynum, Aqua Laurocerasi, Belladonna, Conium, Chloral, Digitalis, Ergota, Hyoscyamus, Ipecacuanha, Nitroglycerinum, Opium, Scilla, Sodii Nitris, Spirit. Æther. Nit., Stramonium, Veratrum Viride.

Sialagogues.—Medicines that increase the secretion of the saliva: Acetum, Acid. Acetic., Acid. Citric., Acid. Tartaric., Æther, Alcohol, Arecoline Hydrobromide, Armoracia, Aurantium, Dilute Acids, and Acid salts, most Emetics (especially Antimony and Ipecacuanha), Hydrargyrum and its salts, Iodides, Ipecacuanha, Jaborandi, Limonis Succus, Mezereum, Physostigma, Pilocarpina, Pilocarpinæ Hydrochloridum, Nitras and Salicylas, Piper, Pyrethrum, Rheum, Sinapis, Tabacum, Tamarindus, Zingiber.

Soporifics.—*See* Hypnotics.

Sternutatories.—Medicines which cause sneezing, and increase the nasal mucous secretion: Ipecacuanha (powdered), Tabacum (snuff), Veratrum Viride (powdered).

Stimulants.—Medicines which increase the function of a part, or of an organ.

Cerebral.—Absinthium, Caffein, Theobromine.

Nervine.—Acid. Arseniosum, Æther, Ammon. Arom. Spt., Ammon. Carb., Ammon. Chlorid., Ammon. Phosph., Asafetida, Belladonna, Calcii Hypophosphis, Cannabis Ind., Cantharis, Castoreum, Coca, Coffee, Ergota, Guarana, Hydrastis, Kola, Musk, Nux Vomica, Oleum Cajuputi, Phosphorus, Spirit. Ammon. Fetid., Strychnina, Valeriana.

Stomachic.—*See* Carminatives and Stomachic Tonics.

Circulatory.—Æther, Æther Aceticus, Æther Spiritus Nitrosi, Alcohol, Ammoniæ Aromat. Spt., Camphor, Convallaria, Digitalis, Strychnina, Sumbul.

Local.—Potass. Chloras. *See* also Counter-Irritants.

Stomachics.—Medicines which directly promote the functions of the stomach and improve the appetite and digestion. *See* Carminatives, and Tonics, Stomachic.

Styptics.—Remedies which arrest bleeding: Acetum, Acid. Sulphuric. Dil., Acid. Tannic., Adrenalin, Albumen, Aluminium Oleate, Argenti Nitras, Benzoin, Bryonia, Catechu, Chinosol, Cinchonæ Pulvis, Collodium, Calcii Chloridum, Cornutine Citrate, Cornutine Hydrochloride, Cotarnine Phthalate (Styptol), Creosote, Cupri Sulphas, Cupri Sulphocarbolas, Ergota, Ergotinine, Erigerontis Oleum, Ferri Perchlor. Liquor and other Ferric salts, Ferri et Ammonii Sulphas, Ferripyrin, Gallæ, Granati Cort., Gummi Rubri Extractum Liquidum, Hæmatoxylum, Hamamelis, Hydrastis, Hydrastininæ Hydrochloridum, Kino, Krameria, Matico, Opium, Plumbi Acetas, Plumbi Sub-acetatis Liquor, Quercus, Quininæ et Ferri Chloridum, Quininæ Hydrochlor., Salipyrin, Spiritus Rectificatus, Stypticin, Suprarenal Gland and Extract, Terebinthinæ Oleum, Zinci Acetas, Zinci Sulph.

Sudorifics.—*See* Diaphoretics. When diaphoretics act very powerfully, they are called sudorifics.

Tonics.—Therapeutic agents which impart strength or tone to the functions of the body or its parts.

Acting through the blood and improving its qualities.—Acid. Arseniosum, Acid. Phosp. Dil., Acidum Nucleinicum and salts, Alboferrin, Carniferrin, Easton's Syrup, Ferri Acetatis Liquor, Ferratin, Fersan, Ferri Albuminas, Ferri Alginas, Ferri Arsenas, F. Bromidum, Ferri Cacodylas, F. Carb. Saccharatus, F. Ammonii Citras, F. et Quininæ Citras, F. Chloroxydum, Ferri Hypophosphis, F. Iodidum, F. Liquor Dialysat., F. Lactas, F. Oxid. Magnet., F. Perchlor., F. Pernit. Liquor, Ferri Peptonas, Ferri et Man. Peptonatis Liq., F. Phosphas, F. Phosph. Co. Syrup. (Squire), Ferri Pilula, F. Redactum, F. Sulphas, F. Tartaratum, Ferripyrin, Ferrichthol, Glycerophosphates, Hæmoglobin and preparations, Lecitogen, Morrhuæ Oleum, Potass. Permang., Sodii Cacodylas, Di-sodii Methylarsenas, Syr. Calcis Lactophos. et c. Ferro, Syrup. Hypophosph. Co.

Nervine.—Acid. Arseniosum, Argenti Nitras, Argenti Oxidum, Calcii Hypophosphis, Cinchona, Coca, Cupri Sulphas, Damiana, Ferrum salts, Glycerophosphates, Guarana, Lecithin, Morrhuæ Oleum, Nux Vomica, Phosphorus, Quinina, Sodii Hypophosphis, Strychnina, Sumbul, Zinci Acetas, Zinci Oxidum, Zinci Phosphid., Zinci Sulph., Zinci Valerianas.

Stomachic and Intestinal.—Acid. Hydrochlor. Dil., A. Nitric. Dil., A. Nitrohydrochlor. Dil., A. Phosph. Dil., A. Sulph. Dil., Aloes, Anthemis, Armoracia, Aurant. Cort., Bebeerina, Bebeerinæ Hydrochlor. and Sulphas, Berberis, Boldo, Buchu, Calumba, Canellæ Cortex, Capsicum, Cascarilla, Chiretta, Cimicifuga, Cinchona, Cinchonidinæ Salicylas, Cinchonidina, Cinchonina, Cusparia, Decoct. Aloes Comp., Erigerontis Oleum, Eupatorium, Gentiana, Guarana, Hydrastis, Ignatia, Krameria, Kava-Kava, Limonis Cortex, Lupulinum, Lupulus, Menyanthes, Mezereon, Nectandra, Nux Vomica, Orexin, Orexin Hydrochloride, Orexin Tannate, Pancreatic Enzymes, Pareira, Pepsin, Peptonised Foods, Piper, Quassia, Quebracho, Quininæ Hydrochloridum, Quininæ Sulph., Rheum, Salicin, Sarsaparilla, Serpentaria, Simaruba, Sinapis, Sodii Chloridum, Strychnina, Taraxacum, Ulmus, Uva Ursi.

Cardiac.—Acidum Arseniosum, Adonis, Adrenalin, Adrenalin Chloride, Æthoxycaffeinum, Apocynum, Caffeina, Caffeinæ Sodio-Benzoas, Caff. Sodio-Salicylas, Convallaria, Convallamarin, Digitalis, Digitalein, Digitalin, Digitin, Digitonin, Digitoxin, Diuretin, Erythrophlæum, Erythrophlæine, and Hydrochloride, Ferrum salts, Nux Vomica, Oxysparteine, Oxysparteine Hydrochloride and Sulphate, Scilla, Sparteinæ Sulphas, Strophanthus, Strychnina, Suprarenal Gland, Veratrum Viride.

Mineral Waters.—Adelheidsquelle, Alet, Altwasser, Auteuil, Berka, Bocklet, Gastein, Kreuznach, Meinbergh, Orezza, Pyrmont, St. Moritz, Spa, Schwalbach, Wildungen.

Vaso-Dilators.—Amyl Nitrite, Erythrol Tetranitrate, Mannitol Hexanitrate, Sodii Nitris, Trinitrin.

Vermicides and Vermifuges.—*See* Anthelmintics.

Vesicants.—*See* Counter-Irritants.

SECTION B.

REMEDIES EMPLOYED IN SPECIAL AILMENTS.

Abortion, Threatened: Ergot in small doses, Hydrastis, Morphina, Opium, Plumbi c. Opio Pil., Potassii Chloras, Viburnum Prunifolium.

Abscess (to abort.) *Internally:* Aconite, Belladonna, Sulphides. *Locally:* Chlori Liquor, Glycerinum Belladonnæ, Iodoformum, Iodum, Acid. Boric., A. Carbolicum, Argenti Nitras, Menthoxol, Pot. Permang.

Acne. Internally: Acid. Nucleinic., Liquor Arsenicalis, Calcii Sulphidum, Vinum Ferri, Ferri et Quin. Cit., Levurine, Saline Purgatives, Confect. Sulphur, Yeast. *Locally:* Belladonna, Benzin, Calamine, Hydrarg. Perchlor. (lotion), Ichthyol, Potassa Sulphurata, Lotio Zinci Oxidi, Resorcin, Sulphur, Ung. Sulphuris Hypochlor., Ung. Sulphuris Iodidi.

Ague.—See *Fever, Malarial.*

Albuminuria. Ammon. Acet. Liq., Antim. Tart., Digitalis, Ferri Perchlor. Tinct., Jaborandi, P. Jalapæ Co., Milk, Nitroglycerin, Potass. Acet., P. Bitart., P. Bicarb., P. Citras, P. Iodid., Saline Purgatives, Sodii Nitris, Strontii Lactas, Suprarenal Gland.

Alcoholism. Ammoniæ Acetat. Liquor, Ammon. Bromid., Ammon. Carb., Armoracia, Arsenic, Calumba, Capsicum, Cimicifuga, Cinchona, Cocainæ Hydrochlor., Gentiana, Hyoscinæ Hydrobrom., Lupulus, Nux Vomica, Opium, Quinina, Atropine and Strychnine.—See also *Delirium Tremens.*

Alopecia Areata. Acetum Cantharidis, Acid. Lactic., Acid. Salicylic., Chrysarobini Ung., Hydrarg. Perchlor. (Lotio), Liniment. Ammon., Lin. Camph. Ammon., Lin. Chloroformi, Linimentum Crinale, Lin. Crotonis, Lin. Sinapis, Lotio Crinalis, Lotio Stimulans, Pilocarpinæ Nitras, Sulphur.

Alteratives.—Section A.

Amenorrhœa. Aloes, Apiol Capsules, Auri et Sodii Chloridum, Calendula, Cantharis, Cimicifuga, Ergota, Ferri Bromidi Syrupus, Ferri Carb. Sacch., Ferri Lactas, Ferri Phosphas, Ferrum Redactum, Guaiaci Resina, Mistura Ferri Co., Menyanthes, Myrrha, Pil. Aloes et Myrrhæ, Potass. Permang., Rutæ Oleum, Saline Purgatives, Sinapis, Hæmatinics, Nervine Tonics.

Anæmia.—See *Tonics, Blood,* Section A.

Anæmia.—Pernicious. Acid. Arseniosum, Acid. Nucleinicum and salts, Acid. Salicylic., Bone Marrow, Ferri Glycerophosph., Hæmoglobin and preparations, Hydrarg. c. Creta, Hyd. Subchlor., Phosphorus, Strychnina; oral, gastric and intestinal antiseptics; Anti-streptococcus serum.

Anæsthetics.—Section A.

Analgesics or Anodynes.—Section A.

Anasarca.—See *Dropsy.*

Aneurism. Aconitum, Amyl Nitris, Gelatin injected subcutaneously, Morphina, Potassii Iodidum in very large doses, Strontii Iodid.

Angina Pectoris. Acid. Arseniosum, Acid. Hydrocyanic Dil., Æther, Ætheris Spt., Ætheris Nitrosi Spt., Æthyl Bromidum, Alcohol, Ammon. Arom. Spt., Amyl Nitris, Argenti Nitras, Belladonna, Chloralamid, Chlorof. Spt., Erythrol Tetranitrate, Ethyl Nitritis Liq., Iso-butyl Nitris, Morphina (hypoderm.), Nitroglycerin, Potass. Iodidum, Pyridin, Sodii Nitris.

Anhidrotics.—Section A.

Ankylostomiasis. Chloroform, Eucalypt. Ol., Filicis Maris Ext. Liq., Saline Aperients, Thymol.

Antacids.—Section A.

Anthelmintics.—Section A.

Anthrax. Acid. Carbolic. (injection), Anti-anthrax serum, Chloride of Zinc Points, Potassa Caustica.

Antidotes.—Section A.

Antilithics.—Section A.

Antiperiodics.—Section A.

Antipyretics.—Section A.

Antiseptics.—Section A.

Antispasmodics.—Section A.

Aperients.—Section A.

Aphrodisiacs.—Section A.

Aphthæ. Acidum Boricum, Acidum Sulphurosum, Alum (pulv.), Argenti Nitras, Glycerinum or Mel Boracis, Myrrha, Potass. Chloras.

Apoplexy. Aloes, Croton. Ol., Elaterium, Hydrarg. Subchlor., Pulvis Jalapæ Co., Ricini Ol., Terebinth. Enema; Stimulants contra-indicated.

Aromatics.—Section A.

Arterio-sclerosis. Erythrol Tetranitrate, Potass. Iodid., Sodii Nitris, Sodii Salicyl. Digitalis and other circulatory stimulants to be avoided.

Ascarides.—See *Anthelmintics.*

Ascites.—See *Dropsy.*

Asthma. Acidum Arseniosum, Acid. Hydrocyanicum Dilutum, Æther, Æthyl Iodidum, Ammon. Fetid. Spirit., Ammoniacum, Ammonii Bromidum, Amyl Nitris, Analgen, Antipyrin, Antifebrin, Apomorph. Hydrochloridum, Atropin. Sulphas, Balsam. Peruvianum, Bals. Tolutanum, Belladonna, Caffeinæ Citras, Camphor, Cannabis Indic., Chloral, Chloroformum, Charta Nitrata et Chlorata, Cocainæ Salicylas, Ethyl Nitris, Eucalypti Oleum, Euphorbia Pilulifera, Grindelia Robusta, Hyoscyamus, Iodipin, Lobelia, Myrrha, Nitroglycerin, Pilocarpinæ Nitras, Piscidia, Potass. Bromid., Pot. Iod., Potass. Nitrat., Pyridin, Quebracho, Radium, Sodii Nitris, Spirit. Etheris Nitrosi, Stramonium, Pulv. Stramonii Comp., Tabaci Folia.

Astringents.—Section A.

Bed Sores. Acidum Boricum, Acid. Sulphuros., Alum. Sulph., Argenti Nitras, Amadou, Balsami Peruviani Ung., Brandy and white of egg mixture, Collodium, Plumbi Tannatis Glycerinum, Zinci Oxid. Ung.

Beri-Beri. Amyl Nitrite, Nitroglycerin, Saline Aperients, Strychnine.

Bile, deficiency of. Fel Bovinum, Hydrargyrum, Sodii Phosphas, Sodii Sulphas. —See *Cholagogues.* Section A.

Biliary Calculi.—See *Gall-stones.*

Bites of fleas, to prevent.—Lavand. Ol., Pyrethri Flores (Insect Powder), Camphora.

Bites and Stings of Insects (ants, bees, gnats, mosquitoes, wasps).—Chloroform, Ipecacuanha, Lotio Acid. Carbolici, Liquor Ammoniæ, Liq. Ammon. Acet. and Methylated Spirit, Liq. Potassæ, Liq. Sodæ, Liq. Plumbi Subacetatis; Oleum Carbolisatum, Oleum Olivæ, Oleum Pulegii, Sodii Bicarb.; *all locally.*

Bites of Rabid Animals. Acid. Carbolic., Argenti Nit., Cautery, Hydrarg. Perchlor.

Bites of Snakes. Acid. Chromic., Cautery, Liquor Ammoniæ, Potass. Permang.; Strych. inject. hypoderm., Tinct. Ammon. Comp., Anti-serum.

Bladder, irritable. Acidum Boricum, Belladonna, Buchu, Cannabis Ind., Chloral Hydras, Hyoscyamus, Opium. *Mineral Waters:* Fachingen, Malvern, Pougues, Langenbrücken, Luhatschowitz. See also *Cystitis*, *Antilithics*, and *Urine, incontinence of.*

Blenorrhagia.—See *Gonorrhœa.*

Blister, to heal. Unguent. Cetacei.

— *to keep open.* Ung. Mezerei, Ung. Sabinæ.

Blood restorers.—See *Tonics*, Section A.

Boils. Internally: Acid. Arsenios., Alkalis, Calx Sulphurata, Nuclein, Purgatives, Tonics, Yeast. *Locally:* Acid. Carbolic., Glycerinum Belladonnæ, Camphor Spir., Collodium, Galban. Comp. Ung., Menthol, Opium, Salol Camphor. *Hypodermically:* Staphylococcus vaccine.

Bones, Fracture of. Internally: Calcii Phosphas.

Bowels, Torpidity of.—See *Cathartics.*

Brain, Inflammation of.—See *Meningitis.*

Breast, Inflammation of. Glycerinum Belladonnæ, *locally*: Phytolacca, *internally* and *locally*.

Breath, Fœtor of. Acid. Carbolic., Carbo Ligni, Creosote, Oxygen, Potass. Chloras, Potass. Permang. See also Antiseptic mouth washes, gargles and inhalations, Gastric tonics and intestinal antiseptics, laxatives; diphtheria, laryngitis, ozœna, phthisis, tonsillitis, etc.

Bright's Disease, Acute. Inflammatory: Aconite, Ammon. Acetat. Liquor, Belladonna, Calcii Chloridum, Cataplasmata, Digitalis, Diuretin, Elaterium, Tinct. Ferri Acet., Jaborandi, Pulv. Jalapæ Co., Juniper Ol., Leeches, Pilocarpin., Pot. Acetas, Pot. Tart. Acid., Saline Purgatives, Scilla Scoparium, Spir. Ætheris Nitrosi, Strontii Lactas.

— *Cirrhotic.* Nitroglycerin. Saline Aperients. See also *Albuminuria*, *Dropsy* (*renal*) and *Uræmia.*

Bronchitis, Acute. Acid. Benzoic., Aconitum, Æther, Ammoniacum, Ammoniæ Liquor, Ammonii Carbon., in large doses, Ammon. Chloridum, Antim. Tart., Apomorphinæ Hydrochloridum, Asafetida, Belladonna, Benzoin Tr. Co., Tinct. Camph. Co., Chloral, Sp. Chlorof., Cimicifuga, Copaiba, Croton. Lin., Dionine, Eucalyptus, Ferri et Am. Citras, Tinct. Ferri Acet. Æther., Galbanum, Heroin, Heroin Hydrochloride, Hyoscyamus, Iodipin, Ipecac., Larix, Lobelia, Oxygen, Paraldehydum, Potass. Iod., Peronine, Plumbi Acet., Pulv. Ipecac. Co., Scilla, Senega, Sinapis Cataplasma, Strophanthus, Strychnina, Terebinth. Ol., Yerba Santa.

Bronchitis, Chronic. Acid. Benzoicum, Æthyl Iodidum, Ammoniaci Mist., Ammon. Carbonas, Asafetida, Bals. Peru and Tolu, Tinctura Benzoini Co., Caffein. Citras, Chloral, Coninæ (Vapor), Codeinæ Syr., Creosoti Vapor, Cubeba, Digitalis, Dionine, Eucalypti Oleum, Euphorb. Pilulif., Grindelia, Heroin, Heroin Hydrochloride, Hydrarg. Pil., Hydrogenii Peroxidi Liquor, Hydrastis, Iodi Fortis Liq. and Vapor, Ipecacuanha, Larix, Lobelia, Menthol, Morrhuæ Oleum, Nux Vomica, Opium, Peronine, Picis Liq. Syr., Pil. Ipecac c. Scilla, Pini Ol., Pini Sylvest. Ol., Pot. Iodid., Pruni Virginianæ Syrup., Quillaia, Quinina, Scilla, Senega, Serpentaria, Sulphur, Tar Water, Terebene, Terebinthinæ Ol.

Bronchocele or simple Parenchymatous Goître. Acidum Fluoricum Dil., Ammon. Fluorid., Hydrarg. Iodid. Rub. Ung., Iodoformum, Iodum, Potass. Iodid., Sodii Iodidum, Thyroglandin, Thyroidei Liquor, Thyroideum Siccum.

Brow Ague.—See *Neuralgia.*

Bruises. Acetum, Acid. Acetic. Dil., Alum, Ammon. Chloridi Lotio, Anthemis, Arnica, Calendulæ Flor., Calendulæ Tinctura, Capsicum, Hamamelis, Plumb. Subacet. Dil. Liq., Saponis Linim., Sodii Chlorid., Sp. Vini Rect.

Bubo, Acute. Glycerin. Belladonnæ, Iodoform, Lotio Acidi Carbolici, Liquor Chlori and other antiseptic dressings.

Bunions. Amadou Plaster, Cupri Oleatis Ung.

Burns and Scalds. Acid. Borici Lotio and Ung., Acid. Picric. (Solutio), Acid. Salicyl. Lotio, Amylum, Benzoyl Peroxide, Oleum Carbolicum, Bismuth. Subnitras, Calcis Lin., Calcii Carbonas Præcip., Calcis Chlorin. Liquor, Carron Oil, Cocaina, Collodium, Creosotum, Creta Præpar., Eucalyptus Gauze or Oil, Flour, Gossypium, Iodoformum and Vaseline, Lini Oleum, Olivæ Oleum, Orthoform, Sp. Rect. *Internally:* Stimulants, Digitalis; Morphine with caution.

Bursitis, Acute. Acid. Carbol. (inject.), Blister, Tinct. Iodi (paint or inject.), Zinc. Chlorid. (inject.).

Calculi, Uric or Lithic Acid, to counteract tendency to formation of.—See *Antilithics,* Section A.

— *Phosphatic.*—See *Cystitis,* and *Urine, phosphatic.*

Calculus, Renal.—See *Urine, phosphatic, Antilithics,* Section A, and *Colic, Renal.*

Cancer, Locally: Acid. Carbol., Acid. Formic., Acid. Nitric., Acid. Sulph. (Nordhausen), Glyc. Acid. Tannic., Antim. Chloride, Arsenical Paste, Conium, Hydrarg. Nit. Acid. Liq., Iodoform, Methyl Violet, Pancreatic Enzymes, Potassa cum Calce, Potass. Permanganas, Quinine Hydrochloride, Radium, Sodii Cinnamas, Sodii Coumaras, Sodii Meta-coumaras, Sodii Meta-vanadas, Strontii Cinnamas, Violets, Zinci Chloridum. *Internally:* Acid. Arsenios., Chelidonium, Chloral Hydras, Condurango, Exalgin, Methyl Violet, Opium, Orthoform, Pancreatic Enzymes, Terebinth. Chia, Thalline Iodide, Thyroid Preparations, Uranium Salicylate.

Carbuncles.—See *Boils.*

Cardiac Tonics.—See *Tonics,* Section A.

Carminatives.—Section A.

Catarrh of the Respiratory Passages (common cold). Acid. Carbolic. (Vapor), Acid. Salicylici (Vapor), Aconitum, Ammoniacum, Ammon. Benz., Ammon. Chlor. (Vapor), Sp. Ammon. Fetid., Amygdala Dulc., Antim. Tart., Apomorphina, Bals. Peruv., Bals. Tolutanum, Benzoin Vapor and Insufflat., Bismuthi Subnitrat. Insuf., Camphora, Cetraria, Cimicifuga, Cinchonidinæ Hydrobromidum, Dulcamara, Eucalyptus, Euphorbia Pilulifera, Ferrier's Snuff, Glycyrrhiza, Hordei Decoctum, Ipecacuanha, Linum, Lobelia, Menthol, Myrrha, Opium, Pini Oleum, Pix Liquid., Pulv. Ipecac. Co., Quininæ Sulph., Resorcin, Sodii Chloridum, Smelling Salts, Senega, Sp. Æther. Nit., Syr. Pruni Virg.

— *Vesical.*—See *Cystitis.*

Cathartics.—Section A.

Caustics.—Section A.

Chafing of Skin. Calamine Dusting Powder, Powdered Talc, Starch, Violet Powder.

Chancres. Acid. Nitric., Acid. Pyrogall., Acid. Sulphuros., Argenti Nitras, Bismuthi Subiodid., Eucalyptol, Hydrarg. Lotio Nigra, Hydr. Nitrat. Liq. Acid., Hydr. Ox. Rubr., Hydrogen. Peroxid. Liq., Iodoform, Iodol, Potass. Permang., Resorcin. *All locally.*

Chapped Skin. Amyli Glycerinum, Cerat. Camphor., Glycerini Unguentum, Glycerin with Rose Water, Lanolin, Vaseline, Ung. Aq. Rosæ.

Chilblains. Acid. Sulphuros., Alum Poultice, Amyli Glycerinum, Argenti Nitras, Aconit. Lin., Belladon. Lin., Boracis Ung., Bynes Ext., Calcii Chloridum, Calcii Lactas, Calcis Chlorinatæ Liq., Camphor, Capsici Lin. or Tinct. Fort., Creosotum, Formaldehyde, Glycerinum, Ichthyol, Iodi Unguent., Morrhuæ Ol., Opii. Lin., Saponis Lin., Ung. Acid. Carbolic., Ung. Glyc. Plumb. Subacet., Tonics.

Chlorosis. Acid. Arsenios., Ferri Bromidi Syrup., Ferri Cacodylas, Ferricthyol, Ferri Glycerophosph., Ferri Chlorox. Liq., Ferri Comp. Mist., Ferri Lactas, Ferri Perchlor. Tinct., Ferri Protochlor., Ferri Sulphas, Ferri Pil., Ferripyrin, Ferrum Redactum, Lecithin, Magnesii Cacodylas, Niccoli Sulphas, Orexin, Orexin Hydrochloride, Orexin Tannate, Sodii Cacodylas, Di-sodii Methylarsenas, Sodii Meta-vanadas, Somatose, Iron Somatose. Gastric sedatives, especially Bismuth and Soda; Aperients such as Magnes. Sulph., Aloin, Ext. Belladon. *Mineral Waters:* Contrexéville, Franzensbad, Levico, Rippoldsau.

Cholagogues.—Section A.

Cholera. Acid. Tannic (Enema), Ammon. Carb., Argenti Nitras, Camphor, Capsicum, Catechu, Creta, Cholera Mixture, Creosotum, Normal Saline transfusion, Opium, Plumbi Acet., Pulv. Salinus (Dr. Stevens), Salol, Sodii Benzoas, Sodii Chlorid., Tinct. Chlorof. et Morph. Co.

— *Infantum.* Acid. Lacticum Dil., Acid. Salicylicum, Acid. Sulph. Dil., Bismuth. Salicylas, Creosotum, Hydr. Subchlor., Menth. Pip. Ol., Plumbi Acetas, Resorcin, Rheum, Ol. Ricini, Salol.

Chordee. Aconitum, Belladonna Suppos., Camphor, Cannabis Indica, Chloral, Lupulinum, Morphine or Opium Suppos., Potassii Bromidum.

Chorea. Acid. Acetylsalicylic., Acid. Formic., Antipyrine, Argenti Nitras, Arsenic. Liquor, Auri et Sodii Chloridum, Camphora Monobrom., Chloral, Chloralamid., Cimicifugin, Conium, Cupri Sulphas, Curara, Ergot, Ferri Pil., Ferrum Salts, Gelsemium, Hyoscyamus, Nux Vomica, Physostigma, Ruta, Scutellarin, Sodii Salicylas, Trional, Valeriana, Zinci Bromid., Zinci Iodidum, Zinci Sulphas, Zinci Valerianas.

Cold in the Head.—See *Catarrh.*

Colic, Intestinal: Æther, Ætheris Nit. Spt., Ammonia, Belladonna, Cajuputi Ol., Lavand. Oleum, Lupulus, Opium, Resorcin, Ricini Oleum, Tr. Chlor. et Morph. Co., Terebinth Ol.

— *Hepatic:* Æther, Belladonna, Cannabis Indica, Chloral, Chloroform (inhalation), Opium. Hot baths.

— *Renal:* Ammon. Boras, Amyl Nitris, Belladonna, Cannabis Indica, Collinsonia, Chloroform (inhalation), Opium, Piperazine, Piperidine Tartrate. Hot baths.

Conjunctivitis, Catarrhal. Acid. Boric. Ung., Alum, Argenti Nitras, Hyd. Ox. Flav. Ung., Hyd. Perchlor., Iron and Cod-liver Oil, Protargol, Zinc. Chlorid. Lot., Zinc. Sulph. Lot.

— *Gonorrhœal.*—See *Ophthalmia Neonatorum.*

Constipation. Aloes Decoct. Co., Aloin, Belladonna, Cambogia, Cascara Sagrada, Cassiæ Pulp., Colocynth. Pil. Co., Croton Ol., Elaterini Pulv. Co., Ficus, Glycerin (enema or suppos.), Glycyrrh. Pulv. Co., Hydrarg. Subchlor., Iridin, Jalap, Magnesia, Magnesii Sulph., Manna, Mel, Nux Vomica, Olivæ Ol., Podophyllin, Potass. Tart. Acid., Purgatin, Ricini Ol., Rheum, Sapo Castil., Scammonium, Senna, Soda Tartarata, Sodii Phosphas, Sodii Sulphas, Sulphur. *Mineral Waters:* Carlsbad, Friedrichshall, Hunyadi-Janos, Pullna.

— *of Infants.* Cassiæ Pulpa, Cascara Elixir, Glycyrrh. Pulv. Co., Magnesia, Rhei Pulv. Co., Ricini Oleum, Scammon. Pulv. Co., Sennæ Syrupus.

— *Habitual:* Aloin, Belladonna, Cascara Sagrada, Coloc. Co. Pilula, Cassiæ Pulpa, Euonymin, Nux Vomica, Podophyllin, Senna.

— *Obstinate:* Cambogia, Colocynthis, Croton Ol., Podophyllin, Tabaci Enemata.

Consumption, Pulmonary.—See *Phthisis.*

Convalescence from Acute Disease. Acid. Phosph. Dil., Calumba, Cascarilla, Chirata, Cinchona, Cusparia, Ferrum Salts, Glycerophosphates, Hypophosphites, Quassia, Quinine, Strychnine.

Convulsions. Ammon. Fetid. Sp., Amyl Nitrite, Asafetida (Enema), Belladonna, Cannabis Indica, Chloral Hydras, Chloroform, Hyoscyamus, Opium, Potass. Bromid., Purgatives, Rutæ Oleum.

Cornea, Ulceration of. Acid. Boric., Argenti Nitras, Atropinæ Sulph. Liq., Atropin. Ung., Hydrarg. Ox. Flav. Ung., Physostigmina. Atropine to be used with caution in the elderly, for fear of glaucoma.

Corns. Acid. Aceticum Glaciale, Argent. Nitras, Collodium Salicylicum, Cupri Oleatis Ungentum, Plumbi c. Sapone Emp.

Corpulence.—See *Obesity.*

Coryza.—See *Catarrh.*

Cough. Acid. Hydrocyan. Dil., Acid. Sulph. Dil., Acaciæ Gum., Agaricus, Amygdalæ Aqua and Mistura, Antim. Vinum, Apomorphina, Bals. Tolu, Benzoin. Tinct. Composita, Codeinæ Syr. and Pastilles, Conium, Copaiba, Creosoti Vapor, Cubeba, Glycerinum, Glycyrrhiza, Ipecacuanha, Lactuca, Linum, Lobelia, Menthol, Morphinæ et Ipecac. Troch., Opium, Piscidia, Pix Liquida, Scilla, Styrax Præp., Terebenum.—See also *Expectorants*, Section A.

— *Spasmodic.* Acid. Hydrocyan. Dil., Belladonna, Cannabis Indica, Ammon. Brom., Tinct. Camph. Comp., Chloral Hydras, Cerii Oxalas, Conium, Hyoscyamus, Opium, Pruni Virg. Syrupus, Stramonium.

Cramp.—See *Antispasmodics.*

Croup. Anti-diphtherial serum, Aconite, Alum, Antim. Tart., Apomorphina, Cupri Sulph., Emetics, Ipecacuanha, Lobelia. *Locally:* Acid. Lactic., Papain. *Externally:* Camph. Linim. Co., Cataplasmata.

Cutaneous Diseases.—See *Eczema, etc., etc.*

Cystitis. Acid. Benzoic., Acid. Boric., Acid. Camphoric., Ammonii Benzoas, Argent. Nitras (Injectio), Bellad. Supposit., Betol, Buchu, Cantharis, Capsicum, Cocaine Lactate, Collinsonia, Copaiba, Cystamine, Cubeba, Grindelia, Glusidum, Guaiacol Cinnamate, Helmitol, Hexamethylenetetramine, Hyoscyamus, Hydrarg. Perchlor. (1 in 2000) irrigation, Kava-Kava, Lysol, Methylene Blue, Morphin. Suppos., Morrhuæ Ol., Naphthalene, Pareira, Potassii Benzoas, Potassii Citras, Potass. Bicarb., Pot. Permang. irrigation, Quinine, Salol, Santal. Flav. Ol., Sodii Benzoas, Sodii Phosphas Acid., Sodii Salicylas, Sulphaminol, Terebinth. Ol., Thymol, Triticum, Tuberculin in tubercular variety, Uresin, Urotropine, Uva Ursi. Laxatives.

Dandriff. Borax Lotion, Hyd. Ammon. Ung., Oleum Carbolicum, Paraffin. Molle, Sapo Mollis.

Debility. Acid. Arsenios., Alcohol, Cajuputi Ol., Calumba, Chemical Food, Cinchona, Coca, Ferrum salts, Formates, Gentiana, Glycerophosphates, Hypophosphites, Lecithin, Morrhuæ Ol., Nuclein, Quassia, Quininæ et Ferri Citras, Strychnina. Tonics, Nervine and Stomachic.

Delirium. Antim. Tart., Belladonna, Cannabis Indica, Hyoscyaminæ Sulphas, Hyoscinæ Hydrobromidum, Methylal, Opium, Potass. Bromidum.

— *Tremens.* Ammoniæ Liquor, Amylene Hydrate, Antim. Tart., Arnica, Cannabis Indica, Camphora, Camphora Monobrom., Capsicum, Chloral Hydras, Chloroformum, Digitalis, Hyoscyaminæ Sulphas, Hyoscinæ Hydrobromidum, Hypnal, Normal Saline, Opium, Potass. Bromid., Scutellarin, Strychnina, Sulphonal.

Demulcents.—Section A.

Depilatory. Barii Sulphidum, Calx Sulphurata, X Rays.

Desiccants.—Section A.

Diabetes Mellitus. Acid. Arsenios., Acid. Lactic. Dil., Acid. Phosphor. Dil., Almond Cakes, Antipyrine, Arsenii Bromidi Liquor, Atropinæ Sulphas, Codeina, Creosotum, Eucalypt. Fol., Ferri Perchlor. Tinct., Ferri Phosphas, Glusidum, Guaiacol Benz., Hydrogenii Peroxidi Liquor, Jambul, Lævulose, Lithii Carbonas, Morphina, Opium, Pancreatin, Pilocarpina, Phosphorus, Potass. Citras, Potass. Permanganas, Sodii Bicarbonas, Sodii Phosphas, Sodii Salicylas, Strychnina, Suprarenal Gland, Uranii Nitras. *Mineral Waters:* Carlsbad, Vichy.

— *Insipidus.* Ergota, Acid. Gallic., Pot. Iod., Opium, Valerian.

Diaphoretics. Section A.

Diarrhœa. Acid. Carbolicum, Acid. Gallicum, Acid. Hydrochlor. Dil., Acid. Nitric. Dil., Acid. Phosph. Dil., Acid. Sulph. Arom., Acid. Sulph. Dil., Acid. Tannic., Alumen, Amylum, Argent. Nitras, Belæ Fructus, Belæ Confectio, Bismal, Bismuthi Subnitras, Bismuthi Salicylas, Bismuthi et Cerii Salicylas, Bismuthi Subgallas, Calcii Carbon. Præcip., Calcis Liquor, Calcis Sacch. Liquor, Camphoræ Essentia, Capsicum, Carbo Ligni, Catechu, Cotoin, Creosote, Creta Præp., Cretæ Aromat. Pulv., P. Cretæ Aromat. c. Opio, Cupri Sulph., Cholera Mixture, Doveri Pulv., Eucalypti Gummi, Ferrum salts, Fortoin, Glutanol, Granati Cort., Guaiacol Valerianate, Guarana, Hæmatoxylum, Honthin, Hydrarg. Perchlor., Hydrarg. cum Creta, Kino, Linum, Naphthol, Opium, Plumbi c. Opio Pil., Plumbi Acetas, Quininæ Carbolas, Quininæ Salicylas, Resorcin, Rhei Tinct., Ricini Oleum, Salol, Sassafras Medulla, Simaruba, Dr. Stevens' Pulvis Salinus, Tannigen.

— *Chronic :* Cascarilla, Coto, Cinchona, Cupri Sulph., Ferri Pernit. Liquor, Hæmatoxylum, Ispaghula, Krameria, Plumbi Acetas, Quininæ Sulph., Simaruba, Tannigen, Tannalbin, Tanocol, Tannoform, Tannone. Intestinal antiseptics.

Diphtheria. Acid. Carbolic. Glycerin., Acid. Formic., Acid. Hydrochloric., Acid. Lacticum (paint and spray), Acid. Nucleinic., and salts, Acid. Sulphuros. (spray), Anti-diphtherial serum, Argenti Nitras, Chlori Liquor, Eucalyptol, Ferri Perchlor. Liq. Fort., Helenin, Hydrarg. Perchlor., Hydrog. Peroxidi Liquor, Iodi Tinct., Iodoform, Iodol, Mag. Sulphis, Menthol Pigmentum, Papain (paint), Phenol Camphor, Potass. Permanganas, Quininæ Sulphas, Resorcin, Sodæ Chlorinatæ Liquor, Sulphur (insufflatio).

Dipsomania.—See *Alcoholism.*

Disinfectants.—Section A.

Diuretics.—Section A.

Dropsy, Cardiac : Apocynum, Caffeina, Convallaria, Digitalis, Diuretin, Elaterium, Juniperi Oleum, Purgatives, Saccharum Lactis, Sparteina, Strophanthus, Ulexine, Veratrum Viride.

— *Hepatic :* Ammon. Chlor., Hydrarg. Pil., Hydrarg. Subchlor., Hydrarg. Subchlor. Co. Pil., Juniperi Oleum, Taraxacum.

— *Renal :* Æther. Nitrosi Spiritus, Ammon. Acetat. Liquor, Apocynum, Diuretin, Digitalis, Elaterium, Hydrargyri Pil., Jaborandi, Jalapa, Juniperi Oleum, Pilocarpina, Potassii Iodidum, Acetas et Nitras, Scilla, Saline Purgatives, Scoparium, Theocin Sodium Acetate.

Dysentery. Acid. Gallic., Acid. Tannic., Alumen, Belæ Confectio, Bismuth Cerium Salicylate, Cascarillæ Infus., Catechu, Cubebæ Oleum, Cupri Sulph., Cuspariæ Infusum, Doveri Pulv., Guarana, Gummi Rubrum, Hamamelis, Hæmatoxylum, Hydrarg. Perchlor., Hydrarg. Subchlor., Ipecacuanha, Lini Decoct., Magnes. Sulphas, Naphthalene, Opium, Phenol Iodatum, Plumb. Acet., Potass. Permang., Quinin. Sulphas, Ricini Oleum, Salol, Salicylates, Simaruba, Sodæ Chlorin., Liq. Sodii Sulphas, Sulphur, Tannigen, Terebinth Ol.

— *Chronic.* Argenti Nitras (enema), Belæ Fructus, Cetraria, Cusparia, Eucalypti Gummi, Guarana, Hæmatoxylum, Ferri Perchlor. Tinctura, Intestinal Antiseptics, Ipecac. c. Opio Pulvis, Kino, Potass. Permang., Plumbi Acet., Plumbi Pil. c. Opio, Rheum, Salol, Simaruba, Tannigen, Yeast.

Dysmenorrhœa. Ammon. Acetat. Liquor, Amyl Nitris (inhalation), Antipyrine, Apiol, Belladonna, Boro-glyceride, Bromides, Cannabis Indica, Cimicifuga, Ergota, Guaiaci Resina, Phenacetin, Pulsatilla, Spirit. Ætheris Nitrosi, Viburnum.

Dyspepsia. Acid. Arsenios., Acid. Carbolic., Acid. Hydrochlor. Dil., Acid. Hydrocyan. Dil., Acid. Nitro-hydrochlor. Dil., Aloes, Ammoniæ Liquor, Ammonii Carbonas, Argenti Nitras, Bismuthi Carb., Bismuthi Subnitras, Buchu, Calc. Carb. Præcip., Calcis Liq., Calumba, Capsicum, Carbo Ligni, Caryophylli Ol., Cascarillæ Inf., Cerii Oxalas, Chiretta, Creosotum, Ferrum salts, Gentiana, Limonis Cortex, Magnesia, Magnesii Carbonas, Malt Extract, Nux Vomica, Orexin Hydrochloride and Tannate, Papain, Pepsin, Peptonised Foods, Potassæ Liquor, Potass. Bicarb., Potass. Bichrom., Potass. Sulph., Quassia, Quininæ Sulph., Rheum, Salicinum, Sapo Durus, Senna, Serpentaria, Sodæ Liq., Sodii Bicarb., Sodii Glycocholas, Sodii Sulphocarbolas, Sodæ Chlorin. Liq., Somatose, Strychnin. Meta-vanadas, Taka-Diastase, Taraxacum, Zingiber. *Mineral Waters:* Alet, Apollinaris, Charlottenbrunnen, Ems, Homburg, Orezza, Vals.—See also *Carminatives*, and *Tonics*, *Stomachic*, Section A.

Dyspnœa.—See *Asthma*, *Bronchitis*, *Cardiac Stimulants* (Section A), *Phthisis*, *Pneumonia*, *Rickets*, *Vaso-dilators* (Section A).

Earache. Almond Oil with Cocaine, Glycerinum, Morphine, or Opium Tincture.

Ecbolics.—Section A.

Eczema. Acid. Arseniosum, Acid. Carbolic., Acid. Picric. (Solutio), Acid. Pyrogallic (oxidised), Acid. Salicylic., Adeps Lanæ, Alkaline Solutions, Aluminii Oleas, Argenti Nitras, Aristol, Betulæ Oleum, Bismuthi Lotio, Cadinum Oleum, Calc. Carbon. Præcip., Camphora, Chaulmoogra Oil, Creosoti Ung., Cremor Lithargyri, Creta Præp., Creolin, Dermatol, Epicarin, Europhen, Gallanol, Glycerinum, Hyd. Ammon. Ung., Hydrarg. Subchlor. Ung., Ichthyol, Lassar's Paste, Lycopodium, Pepsinum, Picis Liquidæ Ung., Potass. Carb. (Lotio), Resorcin, Sodii Arsenas, Sodii Carb., Sodii Sulpho-ichthyolum, Sozoiodol, Tannoform, Ung. Glycerin. Plumbi Subacetatis, Zinci Oxidum. *Mineral Water:* Aix-les-Bains.

— *Chronic:* Acid. Arseniosum, Ol. Betulæ Ung., Cadinum Oleum, Hydrarg. Nitrat. Ung., Hyd. Oxid. Flav. Ung., Naphthol, Paraffinum Liquid., Resorcin, Zinci Oxidum.

Emetics.—Section A.

Emmenagogues.—Section A.

Emollients.—Section A.

Emphysema. Ammon. Carb., Digitalis, Iodipin, Nux Vomica, Pot. Iodid., Pyridin, Quin. Sulph., Saline Aperients.

Epilepsy. Acid. Arseniosum, Æthylene Bromide, Ammon. Bromid., Amyl Nitris, Amylene Hydrate, Argenti Nitras, Atropinæ Sulph., Auri Bromidum, Auri et Potassii Bromidum, Belladonna, Borax, Bromethylformine, Bromipin, Bromohæmol, Camphora Monobrom., Castoreum, Cerii Oxalas, Chloretone, Cupri Sulphas, Cypripedin, Ferri Perchlor. Tinct., Ipecacuanha, Lithii Bromidum, Moschus, Niccoli Bromidum, Nitroglycerin, Opium, Picrotoxinum, Potassii Bromidum, Pot. Iod., Rubidium Bromide, Rubidium Ammonium Bromide, Santonin, Sodii Bromid., Sodii Nitris, Spermin, Strontii Bromidum, Strychnina, Valeriana, Zinci Bromidum, Zinci Lactas, Z. Oxid., Z. Sulph., Z. Valerianas.

Epistaxis. Acid. Tannic., Adrenalin, Alum, Ergota, Galla, Gummi Rubri Extract. Liquid., Ferri Chloroxydi Liquor, Hamamelis, Suprarenal Gland and Extract, Terebinth. Ol.

Erysipelas. *Locally:* Acid. Carbolicum (lotio), Acid. Sulphurosum (spray), Amyli Glycer., Amylum, Argenti Nitras, Belladonnæ Glycerinum, Collodium, Creosotum, Guaiakinol, Ichthyol, Iodi Liquor Fortis, or Ung., Lycopodium, Plumbi c. Opio Lotio, Salol, Thiol. *Internally:* Aconitum, Belladonna, Cinchona, Ferri Perchlor. Tinct., Guaiacol, Lactophenin, Quinina.

Escharotics.—Section A.

Evacuations, Fetid. Acid. Carbolic., Bismuth Beta-naphthol., B. Salicylate, Calomel, Salol, Sodii Salicylas, Potass. Permangan., Sodæ Chlorinatæ Liquor, Stomachic Tonics and Intestinal Antiseptics.

Excoriations. Alum, Acid. Boric., Amylum, Boracis Glycerinum, Calamina Præp., Fuller's Earth, Glycerini Ung., Plumbi Carb., Zinci Oxid.

Expectorants.—Section A.

Expectoration, Fetid: Acid. Carbolic., Chlori Liq., Creosotum. Potass. Permanganas, Menthol and Guaiacol (by intralaryngeal injection).

Eye, to contract pupil of. Physostigmina, Pilocarpina.

— *to dilate pupil of.* Atropina, Belladonna, Daturina, Duboisina, Gelsemium (*locally*), Homatropina, Hyoscyamina, Hyoscina, Scopola, Stramonium.

Fæces, Impacted. Lini Ol. Enema, Ol. Olivæ Enema, Ricini Olei Enema.

Fainting.—See *Syncope.*

Favus. Antiseptics, Cupri Sulphas and Oleas, Epilation, Mercury Ointments, Resorcin.

Febrifuges.—Section A.

Feet, perspiring. Acid. Boric., Iodol, Pulvis Salicylic. cum Talco, Salicylic Suet, Zinci Ung.

Fever.—See *Antipyretics*, Section A.

— *Hay.*—See *Hay Fever.*

— *Malarial.* Arsenicalis Liquor, Atoxyl, Bebeerinæ Sulphas, Berberis, Aristochin, Cinchona, Cinchonidina, Cinchonina, Cinchonidine Sulpho-carbolate, Creosote, Cuspariæ Cort., Euquinine, Methylene Blue, Phenocoll Hydrochloride, Pilocarpine Phenate, Quin. Hydrobrom. Acid., Quin. Hydrochlor. Acid., Quininæ Sulphas and Sulphas Acidus, Salicin, Saloquinine, Warburg's Tincture.

— *Puerperal.* Anti-Puerperal-Fever-Streptococcus Serum; Intra-uterine irrigation with Hydrarg. Perchlor. (1 in 2000).

— *Scarlet.* Acid. Carbolicum, Acid. Sulphurosum, Aconitum, Ammon. Benz., Ammon. Carb., Sodii Salicylas. *Locally:* Acid. Acetic. (vapor), Acid. Carbol. (spray), Acid. Sulphurosum (spray), Chlori Liquor, Resorcin, Sodæ Chlorinatæ Liquor.

— *Typhoid.* Acetanilide, Acid. Carbolic., Acid. Nitr. Dil., Acid. Sulphuros., Ammon. Liq., Amyli Enema, Argent. Nitr., Belladonna, Benzonaphthol, Calomel, Chlori Liq., Cusparia, Guaiaform, Guaiacol Phosphate, Intestinal disinfectants, Iodin. Tinct., Magnesii Salicylas, Naphthalene, Naphthol, Opium, Phenacetin, Phenocoll Hydrochlor., Potass. Permang., Pyramidon, Quinina, Quinin. Hydrochlor. Acid., Quinaphthol, Salicinum, Salol, Saloquinine, Sulphur Sublimat., Terebinth Ol., Thallinæ Sulphas, Thymol, Urotropine.

Flatulence. Acid. Carbolicum, Acid. Sulphurosum, Æther, Aloes, Anethum, Anisum, Armoraciæ Spirit. Co., Asafetida, Bismuth salts, Cajuputi Ol., Calumba, Capsicum, Carbo Ligni, Caryophyllum, Creosotum, Fœniculi Ol., Lavand. Oleum, Magnesia, Menthæ Pip. Ol., Menthæ Virid. Ol., Piper Nigrum, Rutæ Enema, Salacetol, Salol, Sodii Bicarb., Sodii Hyposulphis, Sodii Salicylas, Sodii Sulphocarbolas, Terebinthinæ Enema, Zingiber.

Flooding.—See *Hæmorrhage, Uterine.*

Gall-stones. Æther, Amyl Nitris, Belladonna, Chloral Hydras, Chloroformum, Morphina, Nitroglycerin, Olivæ Oleum, Ricini Oleum, Sapo Durus, Sodii Sulphas, Sodii Phosphas, Terebinthinæ Oleum. *Mineral Water:* Carlsbad.

Gangrene. Tonics and Stimulants. *Locally:* Antiseptics.

Gastralgia. Acid. Arseniosum, Acid. Carbolic., Acid. Hydrocyan. Dil., Acid. Sulphuros., Æther, Anæsthesin, Argenti Nitras, Belladonna, Bismuth salts, Carbo Ligni, Cerii Oxalas, Cocaina, Creosote, Exalgin, Manganesii Oxidum Nig., Opium, Pepsin, Potass. Bicarb., Potass. Bichromas, Potass. Bromid., Resorcin, Sodii Bicarb., Sodii Vanadas, Strontii Bromidum, Tinct. Chlorof. et Morph. Co. *Mineral Water:* Contrexéville.

Generative Organs, loss of tone.—See *Aphrodisiacs.*

— *Sedative of.*—See *Anaphrodisiacs.*

Glands, Lymphatic, chronic inflammation of. Acid. Arseniosum, Ammonii Chloridum, Ammoniaci c. Hydrarg. Emplast., Belladonnæ Glycerinum, Calcii Chlorid., Calx Sulphurata, Carbon Bisulphidum, Ferri Iod. Syr., Hydrarg. Iodid. Rub., Hydrarg. Subchlor., Hydrogenii Peroxidi Liquor, Iodi Liquor

Fortis, Iodi Tinct. (inject.), Iodoform, Morrhuæ Oleum, Potass. Iodid., Lin. Potass. Iodid. c. Sapone, Sodæ Chlorinatæ Liquor. *Mineral Waters:* Kœnigsdorff, Leuk, Marienbad.

Gleet.—See *Chronic Gonorrhœa.*

Glycosuria.—See *Diabetes Mellitus.*

Goitre, Simple Parenchymatous.—See *Bronchocele.*

— *Exophthalmic:* Ammon. Picras, Arsenical. Liq., Digitalis, Ergot, Ferrum, Iodi Tinct., Hyd. Iod. Rub. Ung., Opium, Sodii Phosph., Strontii Bromidum, Strophanthus, Suprarenal Gland, Thymus tablets. Thyroid should never be given.

Gonorrhœa, Acute. Internally: Aconitum, Antim. Tart., Gonal, Hordei Decoct., Hyoscyamus, Lini Inf., Methylene Blue (Pure), Pareira, Potass. Bicarb., Santal. Flav. Ol., Santyl. *Locally:* Actol, Alumen, Argentamin, Argenti Nucleinas, Argonin, Argyrol, Borax, Betol, Bismuth. Subnit., Crurin, Cupri Sulphocarbolas, Gallobromol, Hydrarg. Nucleinas, Ichthargan, Itrol, Iodoform and Eucalyptus Bougies, Largin, Novargan, Potass. Permanganas, Protargol, Sodii Chloridum, Zinci Acetas, Z. Chlorid., Z. Permang., Z. Sulphocarbolas.

— *Chronic, or Gleet. Internally:* Arhovin, Copaiba, Cubeba, Dipterocarpi Balsamum, Ferri Perchlor. Liq. freely, Gonal, Magnes. Sulph., Santali Oleum, Triticum. *Locally:* Acid. Tannic., Argenti Nitras (bougie), Cupri Sulphas, Dextroform, Plumbi Acetas cum Opio, Quercus, Zinci Acetas, Z. Chloridum cum Belladonna, Z. Sulphas.

Gout. Acid. Arseniosum, Acid. Chinic., Ammonii Chloridum, Ammonii Phosphas, Caffeinæ Di-iodo-Hydriodidum, Cajuputi Ol., Chaulmoogra Oil, Chinoline Periodide, Citarin, Colchicum, Colchicinæ Salicylas, Colchi-Sal, Crotonis Lin., Euonymin, Guaiaci Resina, Hydrarg. Pil., Hydrarg. Subchlor., Hyoscyamus, Lithium salts (*see* p. 733), Lysidine, Lycetol, Magnesia, Magnes. Sulph., Mesotan, Morphinæ Inject. Hypod., Phenazonum, Piperazine, Piperazine Quinate (Sidonal), Piperidine Tartrate, Podophyllin, Potass. Acetas, P. Citras, Sabina, Saligenin, Serpentaria, Sodii. Bicarb. S. Phosphas, S. Taurocholas, Sodii Sulphas, Sparteine Periodide, Strontii Salicylas, Sulphur, Trimethylaminæ Hydrochloridum, Uresin, Uricedin, Urosine, Urystamine. *Mineral Waters:* Adelheidsquelle, Aix-les-Bains Baden-Baden, Buxton, Carlsbad, Eilsen, Ems, Franzensbad, Ischia, Marienbad, Nenndorf, Neuenahr, Ofen, Plombières, Soden, Strathpeffer, Tarasp, Toëplitz, Vichy, Weilbach, Wiesbaden, Wildbad.

Gout, painful. Aconitinæ Unguent., Antipyrine, Cajuputi Oleum, Hyoscyamus, Menthol, Morphina, Opium, Potass. Iodidum, Veratrinæ Unguentum.

Gums, inflamed. Alumen, Boracis Glycerin., Gummi Rubri Tinct., Krameriæ Tinct., Myrrhæ Tinct., Myrrhæ et Boracis Tinct., Potassii Chloras, Pyrethri Tinct., Quercus Decoct.

Hæmatemesis. Acid. Gallicum, Acid. Tannicum, Alumen, Argent. Nitras, Ergota, Ferric salts, Hamamelis, Ice, Morphin. Inj. Hypod., Opium, Plumbi Acetas, Sodii Chloridum, Terebinthinæ Oleum.

Hæmatinics.—Section A.

Hæmaturia. Acid. Sulph. Dil., Alumen, Ergota, Ferri Perchloridi Liquor, Hamamelis, Plumbi Acet., Terebinthinæ Oleum.

Hæmophilia. Adrenalin, Calcii Chorid. and Lactas, Ergot, Hamamelis, Terebinth. Ol.

Hæmoptysis. Aconitum, Amyl Nitris, Calomel, Calcii Chloridum, Digitalis, Eucalyptol, Ferri Acetatis Liquor, Gelatinum, Hamamelis, Hydrarg. c. Cretâ, Ipecac., Ipecac. c. Opio P., Sodii Chlorid., Morphina, Opium, Plumbi c. Opio Pilula, Saline Purgatives, Terebene, Terebinth. Oleum, Terpene Hydrate.

Hæmorrhage.—See *Styptics.*

— *Post-partum.* Copious intra-uterine irrigation with water at 118° F., Ergota, Ergotine (Inj. Hypod.). Ergotinine, Normal Saline Solution (Transfusion).

— *Uterine.*—See *Menorrhagia.*

Hæmorrhoids. Acid. Nitricum (lotio), Acid. Tannic. Ung., Aloes Socot., Anusol, Belladon. Ung., Calomel, Cascara Sagrada, Cetacei sine Benz. Unguent., Conii Ung., Galbani Ung. Co., Gallæ Ung. and Ung. cum Opio, Glycyrr. Pulv. Co., Hamamelis, Iodoform (Supp.), Morphina, Picis Pilulæ et Capsulæ, Piper Nigrum, Plumbi Co. Suppos., Sennæ Confect., Stramon. Ung., Sulphur. *Mineral Waters:* Luhatschowitz, Mergentheim.

Hæmostatics.—Section A.

Hair falling off. See *Alopecia.*

Hay fever. Acid. Chromic., Adrenalin, Antipyrine, Belladonna, Camphoræ Spirit., Cannab. Ind., Carbon Tetrachloride, Cocaina, Eucalypti Oleum, Grindelia Robusta, Hydrarg. Biniodidum (spray and douche, 1 in 2000), Lobelia Inflata, Mentholum, Pollantin (anti-serum), Potass. Iodid., Quininæ Sulphas Acidus, Stramonium, Carbolised Smelling Salts, Suprarenal Gland and Extract, Zinci Phosphidum, Zinci Valerianas.

Headache, Internally: Acetanilide, Acid. Hydrobrom. Dil., Ammon. Bromid., Ammon. Liquor., Ammon. Aromat. Spirit., Amyl Nitris (vapor), Antipyrine, Butyl-Chloral Hydras, Cannabis Ind., Caffeina, Cimicifuga, Exalgin, Guarana, Lactophenin, Magnesia, Nitroglycerin, Phenacetin, Potass. Bromid., Pot. Iod., Quininæ Sulphas, Sodii Bicarb., Sodii Salicyl. *Locally:* Aconitum, Æther, Belladonna, Camphora, Cocaina, Menthol, Opii Lin.

Heart, Valvular Disease of. Adonis Vernalis, Apocynum, Æthoxycaffeinum, Caffeina, Convallaria, Digitalis, Erythrophlæum, Sparteina, Strophanthus.

Heartburn.—See *Pyrosis.*

Hectic Sweating.—See *Sweating.*

Hepatics.—See *Cholagogues.* Section A.

Hepatitis. Acid. Nitro-hyd. Dil., Ammon. Chlorid., Hyd. Subchlorid., Pil. Hydrarg., Hyd. Iod. Rub. Ung. Ipecacuanha, Liq. Iodi Fort., Saline Aperients.

Herpes. Internally: Morphinæ Tart. (hypod. inj.), Potass. Iodid., Purgatives, Quininæ Sulphas. *Locally:* Acid. Boric., Amyli Gycerinum, Argenti Nitras, Cocaina, Hydrarg. Ammon., Menthol, Zinci Ung., Unna's Zinc Gelatin.

Hiccough. Ætheris Spt.; Amyl Nitris, Blister over Cervical Spine, Belladonna, Bromides, Camphor, Chloral, Chloroformi Spt., Ergota, Morphina, Nitroglycerin, Pilocarpina, Sinapis Infusum, Terebinth. Ol. ʒi, Zinci Valerianas.

Hydrocele. Acid. Carbolic., Glycerinum and Tinctura Iodi.

Hydrocephalus. Crotonis Oleum, Hydrarg, Subchloridum, Potass. Bromidum, Potass. Iodidum.

Hydrophobia. Cannabis Indica, Chloral Hydras, Chloroformum, Curara, Morphina.

Hypnotics.—Section A.

Hypochondria. Acid. Nitro-hydrochlor. Dil., Cholagogues and Purgatives, Chloral Hydras, Nervine Tonics, Potasii Bromidum, Strychnina. *Mineral Water:* Homburg.

Hysteria. Ammoniæ Fetidus Spiritus, Ammonii Carb., Ammon. Bromid., Ammon Valerianas, Asafetida, Auri Bromidum, Auri et Potassii Bromid., Cajuputi Ol., Camphora, Camphora Monobromata, Castoreum, Tinct. Chloroformi et Morphinæ Co., Ferrum salts, Lavand. Ol., Menthol Valerianate, Moschus, Nux Vomica, Phosphorus, Potass. Bromid., Quininæ Sulph., Rosmarini Ol., Rutæ Ol., Strychnina, Sumbul, Terebinthinæ Ol., Valeriana, Zinci Phosphidum, Z. Valerianas. *Mineral Waters:* Homburg, Lippik, Spa.

Impetigo Contagiosa. Hydrarg. Ammon. Ung., Iodoformi Ung., Zinci Oleat. Ung., Zinci Unguentum; all after removal of crusts by soaking in oil, or starch poulticing.

Incontinence of Urine.—See *Urine.*

Indigestion.—See *Dyspepsia.*

Inflammation. Acute: Aconite, Antim. Tart., Belladonna, Glycer. Bellad., Hydrarg. Subchloridum, Opium.

— *Chronic:* Iodine and Iodides, Iothion.

Influenza. Acid. Carbolic, Acid. Sulphurosum (vapor), Ammon. Acetat. Liq., Antim. Tart., Antipyrine, Benzoini Vapor, Benzol, Calx Sulphurata, Eucalypti Oleum, Eupatorium, Euquinine, Ipecac. Co. Pulvis, Phenocoll Hydrochloride, Potass. Bicarb., Quininæ Sulphas, Resorcin, Salicinum, Salipyrin, Sodii Salicylas, Sp. Æther. Nitr., Tinct. Quininæ Ammoniata.

Insects, to keep away. Camphora, Colocynth. Pulpa, Lavand. Oleum, Menth. Pip., Oleum Pyrethri Flores, Quassia, Rosmarini Oleum, Terebinth. Oleum.

Insomnia.—See *Hypnotics*, Section A.

Iritis. Acid. Boric. Lotio (hot), Atropinæ Guttæ or Ung., Atropin. Methylbromid., Belladonna, Canthar. Emp., Cocaine, Duboisine, Hydrarg. Perchlor. and Subchlor., Hirudines, Hyoscine, Pilocarpin. Nit. Inj. Hyp., Potass. Iodidum, Pulv. Doveri, Quinina.

Irritants.—Section A.

Itch.—See *Scabies.*

Itching.—See *Pruritus.*

Jaundice. Acid. Nitro-hydrochlor. Dil., Alkalis, Aloes, Ammonii Chlorid., Creosotum, Euonymin, Fel Bovinum, Hydrarg. Subchlorid., Iridin, Pilocarpina, Potassa Sulphurata, Podophyllin, Potassii Sulphas, Sapo Durus, Sodii Sulphas, Taraxacum.

Joints, Rheumatic.
— *Enlarged.* Belladonnæ Emp., Hydrarg. Oleas, also with Morphia, Ung. Hydrarg. Comp., Iodum, Lin. Potass. Iod. c. Sapone, Potass Iodid., Plumbi Iodidi Ung., Salocreol, Sodii Salicylas, Veratrinæ Ung.

Kidney Disease.—See *Albuminuria, Bright's Disease, Dropsy* (*Renal*), *and Uræmia. Contra-indicated:* Opium, Cantharides, Turpentine.

Laryngismus Stridulus. Amyl Nitris, Antipyrine, Belladonna, Chloral Hydras, Chloroformum, Potassii Bromidum, Ricini Ol., Rheum, Hot Water.

Laryngitis. Aconiti Tinct., Antim. Tart., Codeina, Guaiacum. *Locally:* Acid. Lactic., Acid. Sulphuros. (spray), Acid. Tannic. Glycerin., Alum, Ammonium Chloride, Argenti Nit., Belladon. Glyc., Benzoini Vapor, Creosoti Vapor, Ice, Menthol (spray), Pini Sylvest. Oleum.

Laxatives.—Section A.

Leech bites, to stop bleeding from. Alum, Argenti Nitras, Collodium, Ferri Perchlor., Matico, Ol. Terebinth.

Leeches, to dislodge if swallowed. Sodii Chloridum, in strong solution.

Leprosy. Balsam. Dipterocarpi, Chaulmoogra Oil.

Leucocythemia. Acid. Arseniosum, Bone Marrow, Ferrum salts, Lecithin, Phosphorus.

Leucorrhœa. Acid. Boric., Acid. Carbolic., Acid. Chromic., Acid. Gallic., Acid. Tannic., Alumen, Bismuth. Subnit., Borax, Cantharis, Catechu, Creolin, Cupri Sulphas, Cyllin, Ferrum salts, Granati Cort., Gummi Eucalyptus, Hæmatoxyli Decoct., Hydrarg. Perchlor., Krameria, Pareira, Potass. Iodidum, Quercus Cort., Quinine Hydrochlor., Santal. Flav. Oleum, Sodii Sulphocarbolas, Tonics, Zinci Sulph., Zinci Sulphocarbolas. *Mineral Waters:* Kreuznach, Wildungen.

Lice.—See *Pediculosis.*

Lichen Planus. Locally: Acid. Carbolic., Acid. Hydrocyan. Dil., Acid. Sulphurosum, Hydrarg. Oxid. Flav. Ung., Ichthyol, Pix Liquida, Zinci Ung. *Internally:* Antimony, Arsenic, Hydrargyrum.

Lips, cracked. Adeps Lanæ, Bals. Peru. Unguent., Cetacei Ung., Paraffinum Molle.

Lithaemia or Lithiasis. See *Antilithics*, Section A.

Liver, Chronic enlargement of. Acid. Nitro-hydrochloric. Dil. (*Internally and Externally*), Ammon. Chloridum, Potassii Iodidum.

Liver, Sluggish or Torpid. Acid. Nitro-hydrochlor. Dil., Alkaline Carbonates and Bicarbonates, Ammon. Chlorid., Euonymin, Hydrarg. Subchlorid., Hydrarg. Pilula, Iridin, Magnes. Sulphas, Podophyllin, Sodii Sulphas, Soda Tartarata.—See also *Cholagogues*. Section A. *Mineral Waters :* Aix-la-Chapelle, Carlsbad, Ems, Friedrichshall, Kissingen, Leamington, Pullna.—See also *Colic* (*Hepatic*), and *Gall-stones.*

Locomotor Ataxy. Acid. Arsenios., Aluminium Chloride, Argenti Nitras, Ergot, Niccoli Sulphas, Phenacetin, Phenazonum, Phosphorus, Physostigma, Pilocarpinæ Nitras, Potass. Iodid.

Lumbago. Acetanilid., Lin. Aconiti, Ammon. Acet. Liq., Arsenic, Antipyrine, Lin. Bellad. Comp., Cantharid. Emp., Capsicum, Cimicifuga, Colchicum, Guaiacum, Ipecac. Co. Pulv., Menthol, Methyl Chloridum, Morphina (hyp. inj.), Opium, Lin. Opii, Picis Empl., Pot. Cit., Phenacetin, Potassii Iodidum, Purgatives, Quininæ Sulphas, Salicin, Sod. Salicyl., Sulphur, Terebinth. Acet. Lin.

Lupus Vulgaris. Acid. Arseniosum, Acid. Carbolic., Acid. Chromic., Acid Formic., Acid. Hydrochloric., Acid. Lacticum, Acid. Pyrogallic. Oxydat., Acid. Salicylic., Aristol, Cinchoninæ Iodo-Sulphas, Hydrarg. Iodid. Rub. Ung., Hydrarg. Nit. Acid. Liquor, Hydrarg. Nitrat. Ung., Hyd. Oleat. Ung., Hydrogen. Peroxid. Liq., Ichthyol, Causticum Iodi, Potassa cum Calce, Potassium Cantharidate, Potass. Permang., Radium, Quin. Sulphat., Salicin, Salicylic and Creosote Plaster Mull, Sodii Ethylatis Liquor, Thiosinamine, Thyroid preparations, Urea, Zinci Chlorid.

Malarial Fever.—See *Fever, Malarial.*

Mania, Acute. Ammon. Bromidum, Amylene Hydrate, Atropina, Belladonna, Camphor, Cannabis Indica, Chloral Hydras, Cimicifuga, Crotonis Oleum, Duboisina, Gelsemium, Hyoscinæ Hydrobromidum, Hyoscyamina, Hypnal, Methylal, Morphina, Opium, Paraldehydum, Potassii Bromidum, Sodii Bromidum, Sulphonal, Trional.

Measles. Aconitum, Æther. Nit. Sp., Ammon. Carb., Ammon. Acet. Liquor, Dover's Powder, Ipecacuanha, Potass. Citras, Quininæ Sulphas.—See also *Pneumonia*, and *Acute Bronchitis.*

Melœna. Ergot (hypodermic), Ferri Perchlor. (inject.), Hamamelis, Plumbi Acet cum Opio (inject.), Terebinth. Oleum.

Melancholia. Acid. Arsenios., Acid. Nitro-hydroch. Dil., Camphora, Coca, Morphina, Nux Vomica, Paraldehyde, Potassii Bromidum, Trional. Also *Cholagogues.*

Meningitis, Acute. Antim. Tart., Chloral, Canthar. Emp., Digitalis, Ergota, Hydr. Subchloridum, Hyoscyamine, Potass. Bromidum, Potass. Iodidum, Purgatives; Ice externally, and Mustard Poultice.

Menorrhagia and Metrorrhagia. Aloes, Alumen, Bebeerinæ Sulphas, Cannabis Ind., Cannabin. Tannas, Ergota, Ferrum salts, Hamamelis, Hydrastis, Krameria, Plumbi Acet., Stypticin, Vincæ Major. Ext. Fluid., Viburnum.

Menstruation, Defective.—See *Amenorrhœa.*

— *Painful.*—See *Dysmenorrhœa.*

Milk Secretion, to increase. Alcohol, Jaborandi, Pilocarpinæ Nit., Potass. Chlorat., Ricini Fol. Decoctum, and Tonics.

— *to diminish.* Atropina, Belladonnæ Tinctura, Emp. and Glycerinum, Ergota, Purgatives.

Miscarriage, to prevent.—See *Abortion, threatened.*

Mollities Ossium. Calcii Phosphas, Ferrum salts, Morrhuæ Oleum.

Morphinomania. Atropinæ Sulphas, Strychnina.

Mumps. Aconitum, Belladon. Glyc., Doveri Pulv., Hydrarg. cum Creta, Jaborandi, Opium, Pilocarpina.

Myxœdema. Thyroidei Liquor, Thyroideum Siccum, Thyroglandin.

Nævi. Acid. Chromic., Acid. Nitric., Alum, Liq. Ferri Perchlor. Fort., Liq. Sodii Ethylatis, Zinc. Chloridum, Zinci Nitras.

Narcotics.—Section A.

Nausea.—See *Vomiting.*

Nephritis.—See *Kidney Disease.*

Neuralgia. Acetanilide, Acid. Arsenios., Acid. Osmic., Aconiti Chloroform., Aconiti Linim., Aconitinæ Ung., Aconitum, Æther (spray), Æthoxycaffeinum, Ammon. Bromidum, Ammon. Chlorid., Ammon. Valerianas, Amyl Nitris, Amygdophenin, Analgen, Antikamnia, Antitoxine, Atropinæ Solut. (hypodermically), Atropinæ Valerianas, Belladonnæ Lin., Butyl-Chloral Hydras, Caffeina, Camphoræ Lin., Camphor. Lin. Ammon., Cannabis Indica, Canthar. Emp., Carbon Tetrachloride, Chloral cum Camphora, Chloroformum, Cimicifuga, Cinchona, Cocaina, Conium, Crotonis Liniment., Delphinina, Exalgin, Ferrum salts, Gelsemii Tinctura, Gelsemin, Guaiacol, Hyoscyamus, Iodoform, Kryofin, Lactophenin, Malakin, Menth. Pip. Oleum, Menthol, Methyl Chloridum, Mesotan, Migrainine, Morphina, Morrhuæ Ol., Opium, Papaveris (Decoctum), Phenacetin, Phenazonum, Phosphorus, Piscidia, Quininæ Glycerophos., Quininæ Sulph., Salophen, Salicin, Scutellarin, Sinapis (Cataplasma), Sodii Salicyl., Strychnina, Veratrinæ Ung., Zinci Valerianas.

Neurasthenia.—See *Debility.*

Nipples, Sore or Fissured. Acid. Sulphurosum, Acid. Tannic. Glycerinum, Argenti Nitras, Bals. Peru. Ung., Boracis Ung., Catechu, Orthoform, Plumbi Tannatis Glycerinum, Sodæ Chlorinatæ Liq.

Nitrate of Silver stains, to remove. Potass. Cyanid., Potass. Iodid, Sodium Thiosulphate.

Nocturnal Emissions. Belladonna, Ferri Bromid., Potass. Bromid.

Nymphomania. Ammon. Bromidum, Camphora, Chloral, Conium, Potassii Bromidum.

Nutritives.—Section A.

Obesity. Alkalis, Ferri Iodid., Fucus Vesiculosus, Potass. Iodid., Thyroideum Siccum. *Mineral Waters:* Carlsbad, Ems, Kissingen, Marienbad, Tarasp.

Ophthalmia Neonatorum. Acid. Boric., Alum, Argentamin, Argent. Iodid. Argent. Nit., Argyrol, Cocaine, Collargol, Cuprargol, Cuprol, Hydrarg. Cyanid., Hydrarg. Ox. Flav. Ung., Hydrag. Perchlorid., Iodoformi Ung., Liq. Calcis Chlorinat., Mitigated Caustic, Protargol, Quinin. Sulphas, Tachiol, Zinci Sulphas.

Orchitis, Acute. Locally: Glycerinum Belladonnæ, Plumbi Acet. et Opii Lotio. *Internally:* Antimonium Tartarat., Guaiacol, Hyoscyamus, Phenylurethane Phytolacca, Saline Aperients.

Otorrhœa. Acid. Borici Lotio, Iodoform, Iodol, Potass. Permang., Zinci Chlorid. *all locally.*

Ozœna. Acid. Carbolic., Acid. Chromic., Acid. Boric., Borax, Boro-glyceride, Creosotum, Iodoform, Menthol, Potass. Permanganas, Sodii Chloridum, Sodæ Chlorinat. Liquor, Sodii Ethylatis Liquor, Thymol, Zinci Chlorid., *all locally.*

Palpitation. Acid. Arsenios., Acid. Hydrobrom., Acid. Nitro-hydrochlor., Aconitum, Æther, Ammonia, Belladonna, Bromides, Anti-dyspeptic remedies, Ferrum salts, Hydrarg. Pil., Syr. Acid. Hydriod., Strychnina.

Paralysis (Peripheral and Functional). Belladonna, Cannabis Ind., Ergota, Ferrum salts, Hyoscyamus, Nux Vomica, Physostigma, Strychnina. *Mineral Waters:* Aix-la-Chapelle, Baden-Baden, Eilsen, Ischia, Kreuznach, Toëplitz.

— *of Lead Poisoning.* Alkaline Sulphates, Potassii Iodidum.

***Parasites, Intestinal.*—See *Anthelmintics*, Section A.**

Pediculosis. Acetum (warm), Bals. Peruvianum, Hyd. Ammon. Ung., Hydrarg. Oleas, Naphthol, Oleum Carbolicum, Paraffin Oil, Resorcin Camphor, Sassafras Ol., Staphisagriæ Olei Ung., Styracis Ung., Sulphur Ung.

Periostitis. Counter-irritants, Iothion, Potassii Iodidum, Vesicants.

Peritonitis, Acute. Belladonna, Hydrarg. Subchlor., Opium, Iodine.

***Perspiration, to diminish.*—See *Anhidrotics*, Section A.**

Perspiration, Fetid. Acid. Boric., Acid. Carbolic., Acid. Salicylic. Glycer., Belladonna, Plumbi Oxid. Ung., Pulv. Salicylic. cum Talco, Salicylic Suet, Zinci Ung.

Phtheiriasis.—See *Pediculosis.*

Phthisis. Acetophenone (inhal.), Acid. Benzoic. (inhal.), Acid. Camphoric., Acid. Carbolicum, Acid. Cinnamic, Acid. Hydrocyan. Dil. (inhal.), Acid. Nucleinicum and salts, Acid. Tannicum, Acid. Hydrofluoric. (inhal.), Aconiti Tinct., Agaricin, Alcohol Methylicum, Antifebrin, Aniline, Atropina, Calcii Hypophosphis, Camph. Tinct. Co., Carbon. Bisulphidum, Chaulmoogra Oil, Chinosol, Codeina, Conium, Cotoin, Creosotum, Creosote Carbonate, C. Phosphate, C. Valerianate, Dionine, Eucalypti Ol. (inhal.), Ferri Cacodylas, Fluoroform, Formaldehyde, Guaiacetin, Guaiacol, G. Benzoate, G. Camphorate, G. Carbonate, G. Cinnamate, and other Guaiacol salts, Guaiacyl, Guaiaform, Helenin, Heroin, Heroin Hydrochloride, Igazol, Iodi Vapor, Iodoform, Lachnanthes, Malti Extractum, Menthol and Menthosol, (intralaryngeally), Morrhuæ Oleum, Opium, Pancreatic Emulsion, Peronine, Piperidine Guaiacolate, Pneumin, Pilocarpinæ Phenas, Pini Oleum (vapor), Plumbi Acetas, Pruni Virgin. Syr., Quinina and Quinine Salts, Radium, Saccharum Lactis, Salol, Sodii Cacodylas, Di-sodii Methylarsenas, Sodii Cinnamas, Stillingia, Strychninæ Vanadas, Sodii Hypophosph., Sodii Meta-vanadas, Strontii Cinnamas, Terebenum, Thiocol, Tuberculin, Urea.

Piles.*—See *Hæmorrhoids.

Pityriasis Versicolor. Acid. Aceticum, Acid. Boric., Acid. Salicyl., Argent. Nitras, Boracis Glycerinum, Cadinum Oleum, Hydr. Oleas, Hydrarg. Oxid. Rub. Ung., Naphthol, Picis Ung., Resorcin, Sodii Hyposulphis, Zinci Ung.

Plague. Acid. Carbolic., Anti-plague serum, Glyc. Belladon., Calomel, Stimulants, Strychnina.

Pleuritis. Aconitum, Antim. Tart., Canthar. Emp., Crotonis Linim., Hydrarg. Subchlor., Iodipin, Morphina, Potass. Iod., Sinapis Cataplasma, Diaphoretics, Expectorants, Laxatives.

Pneumonia. Aconitum, Ammon. Acetat. Liquor, Ammon. Carbonas, Amyl Nitris, Antim. Tart., Æther. Nitrosi Sp., Caffeina, Calcii Chloridum, Canthar. Empl., Carbonis Bisulphid., Digitalis, Helenin, Heroin, Heroin Hydrochloride, Ipecacuanha, Lachnanthes, Moschus, Oxygen, Potass. Bicarb., Quinina, Sinapis Cataplasma, Sodii Salicylas, Strophanthus, Strychnine, Diuretics, Diaphoretics. Cathartics.

Polypi, Nasal. *Locally:* Acid. Chromic., Acid. Tannic., Absolute Alcohol, Sodii Ethylatis Liquor, Zinci Chloridum.

Post-partum Hæmorrhage.*—See *Hæmorrhage, Post-partum.

Prolapsus Ani. Acid. Tannic., Alum, Cupri Sulph., Ergotin, Ferri Perchlor., Gummi Rubr. Extr. Liq., Krameria, Nux Vomica, Quercus, Sulphur.

Prostration. Æther, Ammonia, Caffeina, Coca, Moschus, Nervine Tonics, Spiritus Vini Gallici Mistura, Strychnina.

Pruritus or Itching. *Internally:* Acid. Arsenios., Ammonii Bromid., Hyoscyamus, Quinina, Strychnina. *Locally:* Acid. Boric., Acid. Carbolic., Acid. Hydrocyanic. Dil., Argenti Nit., Bismuth. Subnit., Borax, Cocaina, Creta Gallica, Cupri Sulphas, Glycerin, Ichthyol, Iodoformum, Papaveris (Decoctum), Peruv. Bals., Laurocerasi Aq., Liquor Carbonis Detergens, Plumbi Subacet. Liq., Sodii Bicarb. Lotio., Sulphuris Ung., Zinci Ung.

Pruritus Ani. Acid. Carbolic. Ung., Acid. Salicylic. Ung., Gallæ c. Opio Ung., Hydrarg. Subchlor. Ung., Menthol, Pix Liq., Plumbi. Acet., Purgatives, Resorcin.

— *Vulvæ.* Aluminium Nitrate, Glycerinum Boracis, Cocaina, Ichthyol, Pilocarpine Nitrate, Carbonis Deterg. Liq., Menthol, Plumbi Subacet. Liq.

Psoriasis. *Internally:* Acid. Arsenios., Atoxyl, Dulcamara, Salicin, Thyroideum Siccum. *Locally:* Acid. Carbolic., Acid. Pyrogallic. Oxydat., A. Salicylic., Anthrarobin, Aristol, Betulæ Albæ Olei Ung., Chaulmoogra Oil, Chrysarobinum, Creosotum, Dulcamara (Decoct.), Epicarin, Gallanol, Glycerinum, Hydrarg. Sozoiodolas, Hydrarg. Subchlor., Hydracetin, Ichthyol and Compounds, Liquor Carbonis Detergens, Naphthol, Ol. Cadinum, Picis Unguent., Potassa Sulphurata, Potass. Iodidum, Radium, Resorcin, Saponis Emp., Sodii Carbonas.

Puerperal Convulsions. Chloral, Chloroformum (inhal.), Morphina, Normal Saline, Potassii Bromidum, Thyroid preps.

Purgatives.—Section A.

Purpura. Arsenic, Ferri Perchlor. Tinct., Hyd. c. Creta, Hyd. Perchlor., Calcii Chlorid., Quinina, Sodii Salicylas, Terebinthinæ Ol. or other intestinal antiseptics.

Putrescence, to Correct.—See *Antiseptics*, Section A.

Pyæmia. Alcohol, Ammonia, Antiseptics, Anti-streptococcus or Anti-staphylococcus serum, Quinina.

Pyrosis. Acid. Hydrochlor. Dil., Acid. Sulphuros., Argent. Oxid., Bismuthi Subnitras, Bismuth. Carb., Catechu, Cerii Oxalas, Magnesia, Manganesii Oxid. Præp., Opium, Pulvis Doveri, Sodii Bicarb., Sodii Sulphocarbolas.

Refrigerants.—Section A.

Restoratives.—Section A.

Rheumatism. *Acute:* Acid. Salicylic., Acid. Benzoic., Aconitum, Acetanilide, Acetopyrine, Amygdophenin, Antirheumatin, Betol, Canthar. Emp., Cimicifuga, Gaultheriæ Ol., Limonis Succus, Opium, Methyl-Acetyl Salicylate, Methyl Salicylate, Mesotan, Phenazone, Phenocoll Hydrochloridum, Pot. Acetas, Pot. Bicarb., Potass. Citras, Pulv. Doveri, Piperazine Quinate, Pyramidon Salicylate, Quinina, Rheumatine, Salicinum, Saligenin, Salit, Salocoll, Salol, Salophen, Sodii Di-thiosalicylas, Sodii Salicylas, Tolypyrin, Tolysal, Trimethylaminæ Hydrochloridum.

— *Chronic.* Acid. Acetylsalicylic., Acid. Arseniosum, Acid. Formic., Acid. Salicylic., Aconiti Lin., Aletris, Ammon. Chlorid., Ammon. Phosp., Antim. Sulphurat., Armoracia, Asaprol, Belladonn. Lin. Co., Betol, Buchu, Camphor. Ol. Essent., Capsici Tinct. Fort., Chelsea Pensioner, Chloral, Chloroformum Camphoratum (local), Conium, Cajuputi Ol., Chaulmoogra Oil, Citarin, Citrophen, Crotonis Oleum, Dulcamara, Fluorrheumin, Guaiacol and G. Carbonas, Guaiacum, Hydrarg. Iodid. Rub., Hydrarg. et Morphinæ Oleas, Iodi Liquor Fortis, Iodipin, Ichthyol, Iodoform, Limonis Succus, Lin. Camph. Co., Lithii Guaiacas, Lithii Salicylas, Lycetol, Lysidine, Magnesia, Malakin, Menthol, Mesotan, Methyl-Acetyl Salicylate, Methyl Salicylate, Morrhuæ Oleum, Myristicæ Oleum, Opium, Phenacetin, Phenazonum, Picis Burgundicæ Emplast., Pini Oleum, Pini Sylves. Ol., Piperazine Quinate, Potassa Sulphurata, Potass. Iodid., Lin. Pot. Iod. c. Sapone, Lin. Saponis, Pyramidon Salicylate, Syr. Quininæ Hydrobromidum and Hydriodidum, Salipyrin, Salol, Sarsaparilla, Serpentaria, Sodii Iodid., Sodii Salicylas, Strontii Salicylas, Sulphur, Terebinth. Lin., Trimethylaminæ Hydrochloridum. *Mineral Waters:* Aix-les-Bains, Aix-la-Chapelle, Barèges, Baden-Baden, Bath, Berka, Buxton, Franzensbad, Lucca, Ofen, Toëplitz, Wiesbaden, Woodhall.

— *Painful:* Belladonnæ Chloroformum, Hydrarg. et Morphinæ Oleas, Lin. Camph. Comp.

Rickets. Acid. Phosphor. Dil., Calcis Liquor, Calcii Chloridum, Calcii Phosphas, Creta Præparata, Ferri Phosphas Morrhuæ Oleum, Chemical Food, Thyroid preparations.

Ringworm. Acid. Acetic., Acid. Salicylic., Acid. Sulphuros., Chrysarobini Ung., Cupri Oleatis Ung., Formaldehyde, Glycerinum Acid. Carbol., Hydrarg. Nit. Acid. Liq., Hydrargyri Oleas, Hydrarg. Ammon. Ung., Hyd. Oxid. Rub. Ung., Pigmentum Picis c. Iodo, Ung. Picis, Resorcin, Ung. Sulphuris Comp.

Rubefacients.—Section A.

Salivation, to produce.—See *Sialagogues*, Section A.

— *to diminish.* Atropina, Belladonna.

Sarcina Ventriculi. Acid. Sulphuros., Potassii Sulphis, Sodii Sulphis, Sodii Salicylas, Gastric and intestinal antiseptics.

Scabies. Acid. Sulphuros., Bals. Peruvianum, Calcis Chlorinat. Liq., Calx Sulphurata, Creosotum, Hydrarg. Ammoniatum, Naphthalene, Naphthol, Potassa Sulphurata, Staphisagriæ Olei Ung., Styracis Ung., Sulphocarbolates, Sulphuris Hypochlor. Ung., Sulph. Co. Ung., Sulphuris Ung.

Scalds.—See *Burns and Scalds.*

Scarlet Fever.—See *Fever, Scarlet.*

Sciatica. Acid. Osmic., Aconiti Lin., Ammon. Chloridum, Analgen, Asaprol, Aspirin, Bellad. Lin. Comp., Canthar. Empl., Cimicifuga, Cocainæ Hypoder. Inj., Eucaine Hydrochloride, Ferri Carb. Sacchar., Gelsemium, Guaiacol, Iodoformum, Morphinæ Inj. Hypod., Opium, Phenacetin, Phenazonum, Potass. Iodidum, Purgatives, Sodii Salicylas.—See also *Rheumatism.*

Scorbutic Affections.—See *Scurvy.*

Scurvy. Acid. Citricum, Acid. Tartaricum, Limonis Succus, Potass. Citras.

Scybala. Enemata Olei Lini, Ol. Olivæ and Olei Ricini.

Sea Sickness. Ammon. Brom., Amyl Nitris, Caffeinæ Citras, Caffein, Sodii Salicylas, Camphora, Capsici Tinct., Cerii Oxalas, Chloral, Chloretone, Chlorobrom, Chloroformum, Creosotum, Cocainæ Hydrochloridum, Hyoscyamin. Sulphas, Iodine Tinct., Nitroglycerin, Phenazonum, Potass. Bromidum, Sodii Bromidum, Validol.

Seborrhœa Capitis. Acid. Salicylic. Ung., Benzin, Ol. Carbolic., Ung. Hydrarg. Ox. Rub., Hyd. Sulph. Flav. Ung., Sapo Mollis, Sulphur. Ung.

Sedatives.—Section A.

Septicæmia.—Same as for *Pyæmia.*

Shock, Surgical. Adrenalin (intravenously), Ernutin, Normal Saline. Strychnine and other stimulants not to be given.

Sialagogues.—Section A.

Sickness, to arrest.—See *Vomiting.*

Skin, Abraded. Collodium.—See *Excoriations.*

Sleeplessness.—See *Hypnotics.* Section A.

Smallpox. Acid. Carbolic. Glycerinum, Acid. Salicylic., Argenti Nitras (*local*), Bismuth. Subnit., Chlori Liq., Collodium Flexile, Plumbi Acetas, Potassii Chloras, Quinina, Salol.

Snake Bites.—See *Bites.*

Sneezing, Paroxysmal. Acid. Arsenios., Iodum, Potassii Iodidum. *Locally:* Acid. Chromic., Camphor, Menthol, Sodium Chloride.

Soporifics.—Section A.

Sores.—See *Ulcers.*

Sores, Bed.—See *Bed Sores.*

Sore Nipples.—See *Nipples, Sore.*

Sore Throat.—See *Tonsillitis.*

Spasmodic Affections.—See *Antispasmodics*, Section A.

Spermatorrhœa. Belladonna, Camphor, Camphora Monobromata, Capsicum, Ferrum salts, Nux Vomica, Potassii Bromidum, Purgatives, Quinina, Strychnina.

Spina Bifida. Iodo-Glycerin Solution (Morton's) injected.

Sprains. Aconit. Lin., Bellad. Lin. and Emp., Calendula, Carbolic Fomentation, Cold Douche, Iodi. Liq. Fort., Opii Linim., Lin. Saponis, Sp. Vini Rectif. (lotion), Terebinth. Lin. Acet., Sodii Chloridum (Fomentation).

Stimulants.—Section A.

Stings.—See *Bites and Stings.*

Stomach Pain.—See *Gastralgia* and *Tonics, Stomachic,* Section A.

— *Ulceration of.* Bismuth Carb., Ferri Sulph., Ice, Magnes. Carb., Magnes. Sulph., Morphin. Inj. Hypod., Opium, Peptonised Foods, Potass. Bichromas, Sodii Bicarb.

Stomachics.—Section A.

Stomatitis, Ulcerative. Alum, Borax, Boracis Glycerin., Tinct. Myrrhæ et Boracis, Potass. Chlorat.

Strangury. Belladonn. Suppos., Camphor, Morphin. Hypod. Inj. and Suppos.

Styptics.—Section A.

Sudorifics.—Section A.

Sunstroke. Apomorphina, Atropina, Cold Douche, Phenazonum, Purgatives, Sinapisms.

Sweating, to diminish.—See *Anhidrotics,* Section A, and *Fetid Perspiration,* Section B.

Syncope. Æther, Ammon. Spir. Arom., Spiritus Vini Gallici.

Synovitis. Blisters, Emp. Ammon. c. Hydrarg., Hydrarg. Oleas, Ung. Iodi, Tinct. Iodi (inject.), Pigment. Iodi Co.

Syphilis. Primary and Early Secondary: Acid. Chromic. Pigmentum, Auri Chloridum, Barium Chloride, Calomel Cream, Hydrargyrum and its Compounds, Mercurial Cream, Rubidium Iodide, Stillingia and Fluid Extract.

— *Late Secondary and Tertiary:* Auri et Sodii Chloridum, Iodipin, Iodum and the Iodides, Hydrarg. Carbolas, Hydrarg. Sozoiodolas, Morrhuæ Oleum, Quinine Iodo-hydriodide, Sajodin, Sarsaparilla. *Mineral Waters:* Aix-la-Chapelle, Kreuznach, Vals, Woodhall.

Syphilitic Nodes. Emplastrum Hydrargyri, Potassii Iodidum, Sodii Iodidum.

— *Warts.*—See *Warts, Syphilitic.*

— *Ulcers.* Ung. Amyli Iodidi, Hydrarg. Nit. Liquor Acidus, Iodoformum, Causticum Iodi, Hydrarg. Flava or Nigra Lotio, Hydrarg. Perchlor. Lotio.

Tabes Mesenterica. Hydrarg. Liniment. and Oleas, Iodoformum, Morrhuæ Oleum, Ferrum preparations of, Quinina.

Tape Worm.—See *Anthelmintics,* Section A.

Teeth, Caries of. Acid. Carbolic., Arsenical Paste, Cocaina, Chloral cum Camphora et Cocaina, Creosotum, Mastic Dentaire.

Tetanus. Acid. Carbolic., Amyl Nitris, Atropina, Cannabis Indica, Chloral Hydras, Curara, Magnes. Sulphas, Physostigma.

Thirst, to allay. Acid. Citricum, Acid. Phosphoricum Dil., Acid. Sulph. Aromat. Acid. Tartaricum, Imperial Drink, Limonis Succus.

Throat, Sore.—See *Tonsillitis.*

Thrush.—See *Aphthæ.*

Tic Douloureux.—See *Neuralgia.*

Tinea Capitis.—See *Ringworm.*

Tonics.—Section A.

Tonsils, Enlarged. Internally: Potassii Iodidum. *Locally:* Acid. Carbol. Glycerin., Acid. Tannic. Glycerin, Ferri Perchlor. Glycer., Iodum cum Glycerino or Tinct. Iodi.

— *After Excision of.* Trochiscus Althææ.

Tonsillitis. Internally: Aconitum, Antim. Tart., Hydrarg. c. Creta, Ipecac. Pulv. Co., Sodii Salicylas, Purgatives. *Locally:* Acid. Acetic., Acid. Carbolic. Glyc., Acid. Sulphuros., Acid. Hydrochlor. Dil., Acid. Tannic. Glyc., Alum, Argenti Nitras, Boracis Glyc., Capsicum, Catechu Troch., Cocaina, Chlori Liquor, Cubebæ Troch., Gummi Eucalypt. Troch., Ferri Perchlor. Tr. and Glycerin., Hydrarg. Perchlorid., Krameria, Myrrha, Pigmentum Mandl, Pot. Chloras, Pot. Nitras, Pot. Permang., Rosæ Inf. Acid., Sodæ Chlorinatæ Liq.

Toothache. Acid. Carbolic., Acid. Sulphuros. (spray), Aconite and Iodine, Cajuputi Oleum, Capsici Tinct. Fortior, Caryophylli Oleum, Chloral cum Camphora et Cocaina, Chloroform. c. Camphora, Creosotum, Exalgin, Gelsemii Tinctura, Menthol, Phenol-Camphor, Pyrethrum, Quininæ Ammoniata Tinctura.

Trichiniasis. Glycerin in large doses, Terebinth Ol., Purgatives.

Tuberculosis. Barium Chloride, Calcii Chloridum, Calcii Lactas, Calcii Phosphas, Calx Sulphurata, Ferri Iodid., Ferri Phosphatis Syrup. Co. (Chemical Food), Galium Aparine, Hyd. Subchlor., Iodum, Morrhuæ Oleum, Potass. Iod., Potassæ Liquor, Pot. Bicarb., Quininæ Sulph., Sodii Iodidum. *Mineral Waters:* Adelheidsquelle, Arnstadt, Barèges, Cauterets, Ems, Ischia, Kœnigsdorff, Kosen, Krankenheil, Kreuznach, Luhatschowitz, Neuenahr, Reichenhall, St. Moritz, Soden, Strathpeffer, Vals, Woodhall.—See also *Phthisis.*

Typhoid Fever.—See *Fever, Typhoid.*

Ulcers, Healing or Spreading. Acid. Boric., Argenti Nitras, Bals. Peruv., Bismuth Oxyiodogallate, Calcii Carbon. Præcip., Calcii Iodidum, Calcis Chlorinatæ Liq., Cassia Beareana, Creta Præparat., Cupri Sulphas, Iodipin, Orthoform, Plumbi Acetas, Plumbi Carb., Resinæ Emp., Sabina, Zinci Sulphas, Zinci Ung.

— *Malignant.* Acid. Chromic., Acid. Nitric., Antim. Chlor. Liquor., Potassa Caustica, Radium, Zinci Chlorid.

— *Foul.* Acid. Carbolic., Acid. Chromic., Acid. Lactic., Acid. Salicylic., Acid. Sulphuros., Argenti Nitras, Bismuthi Subiod., Calcis Chlorinatæ Liquor, Carbo Ligni, Chlori Liq., Calx Chlorin., Cinchona, Cupri Subacetas, Eucalypti Ung., Hydrarg. Perchlor. Lotio, Iodoform, Potassa Caustica, Potass. Permanganas, Resorcin, Sodæ Chlorinatæ Liquor, Zinci Chloridum.

— *Indolent or Callous or Chronic.* Acid. Chromic., Alumen Exsic., Argent. Nit., Bals. Peruvianum, Benzoini Tinct. Co., Cupri Acetas, C. Subacetas, C. Sulphas, Elemi Ung., Hydrarg. Lin., Hydrarg. Oxid. Rubr. Ung., Ichthyol, Kino, Lotio Rubra, Pepsinum, Sabinæ Ung., Unna's Paste, Zinci Chloridum.

Uræmia. Aconite, Amyl Nitris, Caffeina, Digitalis, Pulv. Elater. Co., Pulv. Jalapæ Co., Jaborandi, Magnes. Sulph., Nitroglycerin, Normal Saline Solution (transfusion), Pilocarpina (hypodermically), Potass. Acet., Potass. Bicarb., Spt. Æther. Nitrosi, Venesection, Chloroform for the convulsions.

Urethritis. Alkalis, Saline Purgatives, Oleo-Balsams, Alcohol interdicted.—See also *Gonorrhœa, acute and chronic.*

Urine, Alkalinity of.—See *Urine, Phosphatic*, and *Cystitis.*

— *Deposit of Uric Acid or Urates in.*—See *Antilithics*, Section A, also *Gout.*

— *Phosphatic.* Acid. Nitrohydrochlor. Dil., and other acids. Sodii Phosph. Acid. in full doses, Urotropine. See also *Cystitis.*

— *Incontinence of.* Ammon. Benzoas, Acid. Phosphoric., Belladonna, Buchu, Cantharis, Chloral, Creosotum, Ergota, Ferri Perchlor., Hyoscyamus, Lycopodii Tinct., Potass. Citras, Quinina, Sodii Benzoas, Strychnina, Tonics, Urotropine.

— *Decomposing.*—See *Cystitis.*

Urticaria. Acid. Hydrocy. Dil., Acid. Salicylic., Balsam. Peruvianum, Ichthyol, Liquor Calcis, Potass. Carb. (Lotio), Sodii Salicyl., Ung. Zinci, Cathartics Stomachics.

Uterus, Hæmorrhage of.—See *Hæmorrhage.*

— *Inflammation of.* Acid. Carbolic. Glyc., Argenti Nitras, Iodoform., Iodum preps., Iodised Phenol, Zinci Sulphas.

— *to contract.*—See *Ecbolics*, Section A.

Uvula, Relaxed. Catechu Troch., Capsicum, Guaiaci Troch., Gummi Eucalyptus, Krameria, Pyrethrum, Rosæ Inf. Acid. See also *Tonsillitis.*

Varicose Veins. Ext. Ergot. Liquid, Tinct. Ferri Perchlor., Hamamelis.

Vermifuges.—Section A.

Vesical Catarrh.—See *Cystitis.*

Vesicants.—Section A.

Vomiting, to allay.—See *Sedatives, gastric and nervine*, Section A.

— *in Pregnancy.* Acid. Carbol., Acid. Hydrocyan. Dil., Bismuth. Subnit., Chloral, Chloretone, Calcis Saccharat. Liquor, Cerii Oxalas, Cocainæ Hydrochloridum, Creosotum, Gentianæ Inf., Ipecac., Potass. Bromid., Sodii Bicarb.

Warts. Acid. Acetic. Glaciale, Acid. Chromic., Acid. Nitric., Argenti Nitras, Cupri Oleatis Ung., Hydrarg. Nitrat. Acid. Liquor, Sodii Ethylatis Liquor.

— *Syphilitic.* Argenti Nit., Hyd. Iodidi Rub. Ung., Hyd. Nit. Acid. Liquor.

Wasp Sting.—See *Bites and Stings of Insects.*

Wax, Indurated.—Glycerinum, Oleum Amygdalæ, Sodii Bicarb. Sol.

Whites.—See *Leucorrhœa.*

Whooping-Cough. Acid. Acetylsalicylic., Acid. Carbolic., Acid. Cresylicum (inhal.), Acid. Hydrocy. Dil., Alum, Ammon. Bromid., Antipyrine, Antitussin, Atropina, Belladonna, Bromoform, Cannabis Ind., Caryoph. Oleum, Chloral, Tinct. Chlorofomi et Morphinæ Co., Conium, Eucalypti Oleum, Euphorbia Pilulif., Euquinine, Grindelia, Hydrogen. Peroxid., Ipecacuanha, Lobelia, Potass. Bromid., Quininæ Tannas, Resorcin, Succini Lin., Trifolii Syrupus, Tussol, Zinci Sulphas.

Worms, Ascarides, Tape, and Round Worms.—See *Anthelmintics*, Section A.

Wounds. Acid. Boric., Acid. Carbol., Acid. Sulphuros., Acid. Trichloracetic, Aluminii Acetat. Liquor., all Antiseptics (Section A), Arnicæ Tinctura, Tinct. Benz. Co., Bismuth. Subnit., Collodium Flexile, Glycerinum, Iodoformum, Iodol, Sal Alembroth.

— *Poisoned.* Acid. Carbolic., Argenti Nitras., Hydrarg. Perchlor. or other antiseptic.

INDEX.

The Names adopted by the British Pharmacopœia are put in Roman letters; all others, whether referring to Official or Not Official Medicines, are put in Italics. The Appendix is not indexed.

As the available space for the doses in the Index is very limited, the following abbreviations are used:—gr. for grain; drm. for drachm (either solid or fluid); oz. for ounce (solid or fluid); and min. for minim.

	Dose.	Page
Abbreviations		viii
A.B.C. Liniment		95
Abercrombie's Cough Mixture		1065
Abernethy's Pills		436
Abrastol	5 to 15 gr.	806
Abrin		706
Abrus Precatorius		705
Absinthe		1
Absinthin		1
Absinthium		1
Absolute Alcohol		113
Absorbent Cotton-Wool		575
Acaciæ Cortex		4
Acaciæ Gummi		1
Açafrao		458
Acalypha		4
A.C.E. Mixture		377
Aceite		824
,, *Alcanforado*		308
,, *de Almendras Dulces*		151
,, ,, *Beleno*		648
,, ,, *Belladonna*		234
,, ,, *Cacao*		1203
,, ,, *Cantaridas*		321
,, ,, *Croton Tiglio*		459
,, *Fosforado*		884
,, *de Helecho Macho*		540
,, ,, *Higado de Bacalao*		790
,, ,, *Linaza*		731
,, ,, *Manzanilla Alcanforado*		168
,, ,, *Olivas*		824
,, ,, *Parafina*		860
,, ,, *Ricino*		1018
,, ,, *Ruda*		1029
,, *Volatil de Almendras Amargras*		152
,, ,, *de Canela*		398
,, ,, *Eucalipto*		495
,, ,, *Limon*		723
,, ,, *Menta Piperita*		765
Acetanilidum	1 to 3 gr.	5
Acetas Plumbi		911
,, *Plumbicus*		911
Acetate Basique de Plomb Dissous		919
,, *d'Ethyle*		107
,, *de Morphine*		782
,, *Neutre de Plomb*		911
,, *de Potassium*		933
,, ,, *Sodium*		1090
,, ,, *Zinc*		1239

	Dose.	Page
Acetato Basico di Piombo		919
,, *de Chumbo*		912
,, ,, *Cobre bibasico*		465
,, *di Morfina*		782
,, ,, *Piombo*		911
,, *de Plomo*		912
,, ,, ,, *Liquido*		919
,, *Plumbico*		911
,, *(sub) Plumbico Liquido*		919
,, *di Potassio*		933
,, ,, *Sodio*		1090
,, *Zincico*		1239
,, *di Zinco*		1239
Acetic Acid		9
,, Ether		107
Aceto		9
Acetone		321
,, *Chloroform*		369
Acetopyrine	5 to 10 gr.	879
Acet-phenetidinum		874
Acetum	1 fl. drm. to 1 fl. oz.	9
,, *Aromaticum*		13
,, Cantharidis		319
,, *Cantharidinæ*		319
,, Ipecacuanhæ	10 to 30 min.	682
,, *Mylabridis*		319
,, *Odoratum*		13
,, *Opii*	8 min.	841
,, Scillæ	10 to 30 min.	1063
,, *Urgineæ*		1064
Acetyl-methylene-diguaiacol		587
Acetylparamidophenol Salicylate		1040
Acétylpara-amino-salol		1040
Acetylphenylhydrazin		8
Acetylsalicylic Acid	10 to 15 gr.	78
Acibar		116
,, *Barbado*		117
,, *Sucotrino*		118
Acid value of Gums and Gum-resins		1318
Acide Acétique		9
,, ,, *crystallisable*		11
,, *Azotique*		61
,, *Benzoïque*		19
,, *Borique*		22
,, *Bromhydrique Dissous*		47
,, *Chlorhydrique Officinal*		50
,, *Chromique Cristallise*		37
,, *Citrique*		39
,, *Cyanhydrique Dissous*		53

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Acide Gallique		45
,, *Lactique*		57
,, *Oleique*		65
,, *Osmique*		67
,, *Oxalique*		67
,, *Phosphorique Officinal*		68
,, *Salicylique*		73
,, *Sulfureux*		83
,, *Sulfurique Officinal*		79
,, *Tartrique*		89
Acido Acetico		9
,, ,, *Aquoso*		11
,, ,, *Concentrato*		12
,, ,, *Cristalizable*		12
,, ,, *Glacial*		12
,, ,, *Hydratado*		10
,, *Agallico*		45
,, *Arsenioso*		15
,, *Benzoico*		19
,, *Borico*		22
,, *Bromidrico*		47
,, *Cianhidrico medicinal*		53
,, *Cianidrico*		53
,, *Citrico*		39
,, *Clorhidrico*		50
,, *Clorhidrico Concentrato*		50
,, *Cromico*		37
,, *Fenico*		27
,, *Fosforico*		68
,, *Gallico*		45
,, *Lactico*		57
,, *Lattico*		57
,, *Nitrico*		61
,, *Nitrico Concentrato*		61
,, *Oleico*		65
,, *Ossalico*		67
,, *Salicilico*		73
,, *Solforoso*		83
,, *Sulfurico*		79
,, ,, *Aromatico*		81
,, *Tannico*		84
,, *Tartarico*		89
,, *Tartrico*		89
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,, ,, *Aromaticum*		13
,, ,, *Concentratum*		12
,, ,, Dilutum	½ to 2 fl. drm.	11
,, ,, Glaciale		11
,, *Acetylsalicylicum*		78
,, *Agaricicum*		112
,, *Anisicum*		166
,, *Arsenicosum*		15
,, Arseniosum	$\frac{1}{60}$ to $\frac{1}{15}$ gr.	14
,, Benzoicum	5 to 15 gr.	19
,, Boricum	5 to 15 gr.	22
,, *Boro-glycerinatum*		25
,, *Cacodylicum*		1104
,, *Camphoricum*		313
,, *Carbazoticum*		71
,, Carbolicum	1 to 3 gr.	27
,, ,, *Camphoratum*		36
,, ,, *Crudum*		36
,, ,, Liquefactum	1 to 3 min.	33
,, *Catharticum*		1076
,, *Cetraricum*		358
,, *Chinicum*	1 to 5 gr.	394
,, Chromicum		37
,, *Chrysophanicum*		39
,, *Cinnamicum*		39
,, Citricum	5 to 20 gr.	39
,, *Cresotinicum*		44
,, *Cresylicum*		42
,, *Dibromogallicum*		47
,, *Di-Iodo Salicylicum*		79
,, *Ellagicum*		47
,, *Embelicum*		483
,, *Filicicum*		540
Acidum *Formicum*	2 to 5 min.	44
,, Gallicum	5 to 15 gr.	45
,, *Gelsemicum*		559
,, *Glycerophosphoricum*		286
,, *Hydriodicum*		47
,, ,, *Dilutum*		47
,, Hydrobromicum, Dilutum	15 to 60 min.	47
,, Hydrochloricum		50
,, ,, *Crudum*		51
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,, *Oleicum*		65
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,, *Pyrogallicum*		72
,, *Pyroligneosum Crudum*		9
,, ,, *Rectificatum*		9
,, *Quillaicum*		980
,, *Quinicum*		394
,, Salicylicum	5 to 20 gr.	73
,, *Scleroticum*		489
,, *Sphacelinicum*		491
,, *Stearicum*		66
,, *Sulphocarbolicum*		37
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,, ,, *Alcoholisatum*		82
,, ,, Aromaticum	5 to 20 min.	81
,, ,, Dilutum	5 to 20 min.	82
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,, Tannicum	2 to 5 gr.	84
,, Tartaricum	5 to 20 gr.	89
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,, *Naphthol*		894
Alphol		807
Alquitran		908
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,, ,, ,, *Sulphas*		125
,, *Borotartras*		129
,, *Borotannas*		129
,, *Caseinas*	5 gr.	129
,, *Chloridum*	5 to 8 gr.	128
,, ,, *Hydratum*		128
,, *Naphthol Sulphonas*	4 to 8 gr	128
,, *Nitras*		128
,, *Oleas*		128
,, *et Potassii Salicylas*		129
,, ,, ,, *Sulphas*		125
,, *Salicylas*		129
,, *Sulphas*		128
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Alypin	$\frac{1}{16}$ to $\frac{1}{4}$ gr.	417
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,, *Douces*		154
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,, *Vinum*		392
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Chinesischer Zimmt (Cassia)		395
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Chininum bisulphas		988
,, *bisulphuricum*		988
,, *Ferro Citricum*		516
,, *Hydrochloricum*		992
,, *Sulphuricum*		999
Chinoidin		990
Chinoline		990
,, *Periodide*		990
Chinosol		991
Chinotropine	10 to 15 gr.	547
Chirata		360
Chirette		360
Chlorœthoform		378
Chlorœthyl		110
Chloral *Camphoratum*		366
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,, *Carbolatum*		366
,, *Formamide*		367
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,, *Tannin*		366
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Chloreto de Ammonio		145
,, ,, *Calcio*		283
,, *Ferrico Anhydro*		521
,, ,, *Crystallisado*		521
,, *Mercurico*		623
,, *Mercuroso*		627
,, *de Ouro*		212
,, ,, *e de Sodio*		212
Chloretone	5 to 20 gr.	369
,, *Elixir*		369
Chloretum Æthylicum		111
,, *Amido-hydrargyricum*		631
,, *Ammonicum*		144
,, *Chinicum*		992
,, *Ferricum*		521
,, *Hydrargyrico-Ammonicum*		631
,, *Hydrargyricum*		621
,, ,, *Corrosivum*		623
,, *Hydrargyrosum*		627
,, ,, *Precipitatum*		627
,, ,, *ope Vaporis Aquæ paratum*		627
,, *Pilocarpicum*		896
Chlorhydras Quininæ		992
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,, *de Cocaïne*		405
,, ,, *Morphine*		784
,, *Basique de Quinine*		991
,, *neutre de Quinine*		994
Chlori Liquor	10 to 20 min.	369
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,, ,, *Chinina*		991
,, ,, *Morfina*		784
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,, *Belladonnæ*		235
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,, *Hyoscyami*		647
,, *Iodi*		671
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,, *de Soude Dissous*		301
,, ,, *Zinc*		1242
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,, *Mercuroso*		626
,, *Sodico*		1109
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Coing		472
Cola de Pescada		655
Colantro		448
Colchicein		432
Colchici Cormus		426
,, Semina		429
Colchicina	$\frac{1}{120}$ to $\frac{1}{32}$ gr.	432
Colchicinæ Salicylas	$\frac{1}{120}$ to $\frac{1}{32}$ gr.	433
Colchicine		432
Colchicum	2 to 5 gr.	426
Colchique		426
Colchi-sal		432
Cold Cream		358, 1026
Coley's Fluid		1268
Colic Root		115
Colla de Pesce		655
,, *Piscium*		655
Collargol		188
Colle de Poisson		655
Collemplastrum Adhæsivum		76
,, *Salicylatum*		76
Collinsonia	15 to 60 gr.	433
Collodio		976
Collodion Cantaridado		320
,, *Hæmostatic, Dr. Paresi's*		977
Collodium		976
,, *Acetonum*		975
,, *c. Acido Salicylico*		77
,, *Anodynum*		977
,, *Belladonnæ*		236
,, *Callosum*		77
,, *Cantharidini*		321
,, *Elacticum*		976
,, Flexile		976
,, *Iodatum*		671
,, *Iodi*		671
,, *Iodoformi*		664
,, *Lacto Salicylicum*		77
,, *Salicylicum*		77
,, ,, *Compositum*		77
,, ,, *c. Zinci Chlorido*		77
,, *Stypticum*		976
,, *Tiglii*		461
,, *Vesicans*		320
Colloid Mercury		606
,, *Silver*		188
,, *Styptic*		976
Colloidal Bismuth Oxide		258
,, *Hæmoglobin*		593
Colloxylinum		975
Collunarium Alkalinum		1099
,, ,, Co.		1099
Collyre au Sulfate de Zinc		1251
Collyrium Acidi Borici		26
,, ,, ,, *et Zinci Sulphatis*		26
,, *Opii*		844
Colocynthidis Pulpa	2 to 8 gr.	433
Colofonia		1006
Colombo		295
Colophonium		1006
Coloquinte		433
Coloquintida		433
Coloquintide		433
Colorin de peces		905
Colutorio Boratado		261
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,, *Guaiaci Composita*		583
,, *Opii*		842
,, Piperis	.60 to 120 gr.	903
,, Rosæ Gallicæ		1022
,, *Rutæ*		1030
,, *Scammonii*	10 to 30 gr.	1061
Confectio Sennæ	.60 to 120 gr.	1074
,, Sulphuris	.60 to 120 gr.	1179
,, *Terebinthinæ*		1201
Conii Folia		438
,, Fructus		439
Coniina		441
Coninæ Hydrobromidum	$\frac{1}{6}$ to 2 gr.	442
,, *Hydrochloridum*		442
Conium		437
Convallamarin	$\frac{1}{8}$ to 2 gr.	443
Convallaria		443
Convallarin		443
Convolvulin		700
Copahu		443
Copaiba	.30 to 60 min.	443
Copaiva		443
Copaivabalsam		443
Copper. (See also Cuprum)		
,, *Aseptol*		468
,, *Nucleinate*		810
,, *and Silver Albuminate*		468
Coquelicot		1017
Coriandre		448
Coriandri Fructus	20 to 60 gr.	448
Coriandro		448
Cornezuelo de Centeno		483
Cornutina		491
Cornutinæ Citras	$\frac{1}{12}$ to $\frac{1}{6}$ gr.	489
,, *Ergotas*		490
,, *Hydrochloridum*		489
Corrosive Sublimate		621
,, ,, *Discs*		624
Corteccia de Angustura		469
Cortex Frangulæ		1011
Corteza de Angostura		469
,, ,, *Granado*		576
,, ,, *Quillaya*		980
Corvalho		979
Coryl		111
Coscinium		295
Cosmoline		862
Coster's Paste		672
Cotarninæ Hydrochloridum	$\frac{1}{3}$ to $\frac{1}{2}$ gr.	845
,, *Phthalas*	$\frac{3}{4}$ gr.	845
Coto		450
Cotoin	$\frac{1}{2}$ to 2 gr.	450
Coton hydrophile		575
,, *Iodé*		671
Cotone Absorbente		575
,, *Collodio*		975
Cotton		575
Cotton-Wool		575
Couch Grass		1219
Couso		471
Cuernecillo de Centeno		485
Crameria		713
Cravagem de Centeio		485
Cravinho		333
Crayons d'Azotate d'Argent		186
,, ,, ,, *Mitigé*		186
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,, ,, ,, *Soluble*		968
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,, *Lithargyri*		921
,, *Morrhuæ Pancreaticus*		793
Creolin (Artmann's)		43
,, *(Jeyes')*		43
,, *(Pearson's)*		43
Creosol		451
Creosotal		455
Creosoti Carbonas		455
,, *Oleas*	15 to 30 gr.	455
,, *Phosphas*	5 to 15 gr.	455
,, *Tannas*	5 to 15 gr.	455
,, *Valerianas*		455
Creosota		450

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Créosote Officinale		450
,, *Salicylic Ester*		455
Creosotum	1 to 5 min.	450
Cresilol		42
Cresol		42
Cresolum Crudum		42
,, *Saponatum*		43
Cresotinic Acid		44
Cresylic Acid		42
Creta *Gallica*		129, 1192
,, Præparata	10 to 60 gr.	456
Crinale Linimentum		322
Crisarobina		378
Crocus		457
Croton-chloral Hydrate		267
Croton Oil Pencils		461
Crotonis Oleum	½ to 1 min.	459
Crurin		258, 991
Cuasia		977
Cubeba		462
Cubebæ Fructus	30 to 60 gr.	462
Cubèbe		462
Cucurbitæ Semina Preparata	3 to 4 oz.	464
Cuernecillo de Centeno		485
Culantro		448
Culvers Root		721
Cuprargol		468
Cupri *Acetas*		465
,, *Nucleinas*		810
,, *Oleas*		468
,, *Subacetas*		465
,, Sulphas	¼ to 2 gr.	466
,, ,, *Crudus*		466
,, *Sulphocarbolas*		37, 468
Cuprohæmol		593
Cuprol		810
Cuprum Aluminatum		468
Curaçao Aloes		117
Curara	$\frac{1}{12}$ to ¼ gr.	468
Curarine		468
Curaro		469
Curd Soap		1047
Cuso		471
Cusparadine		469
Cuspariæ Cortex		469
Cusparine		469
,, *Hydrochloride*		469
,, *Sulphate*		469
Cusso	¼ to ½ oz.	471
Cutch		348
Cutol		129
Cyaneto Mercurico		607
Cyanure Mercurique		607
,, *de Potassium*		949
Cyanuretum Hydrargyri		607
Cyanwasserstoffsaure		53
Cydonium		471
Cyllin		472
Cynoglossine		472
Cynoglossum		472
Cypripedin	1 to 5 gr.	472
Cypripedium		472
Cystamine	5 to 10 gr.	545
Cystisine		1221
Damiana		473
Damson, Mountain		1079
Daturæ Folia		1154
,, Semina		1157
Daturine		1157
De Backer's Fluid		1268
Decoctum *Acaciæ Corticis*		4
,, *Agropyri*	½ to 2 fl. oz.	1220
,, Aloes Compositum	½ to 2 fl. oz.	121
,, ,, ,, (*Squire*)	½ to 2 fl. oz.	131
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,, *Cassiæ Beareanæ*		344
,, *Caulophylli*	1 to 2 fl. oz.	349
,, *Cetrariæ*	1 to 4 fl. oz.	359
,, *Chinæ c. Senega*		391
,, *Chondri*		359
,, *Cinchonæ*	1 to 2 fl. oz.	391
,, *Cissampeli*	½ to 2 fl. oz.	867
,, *Cydonii*		472
,, *Gallæ*		552
,, *Gossypii Radicis Corticis*	½ to 2 fl. oz.	576
,, Granati Corticis	½ to 2 fl. oz.	578
,, Hæmatoxyli	½ to 2 fl. oz.	592
,, *Hordei*	1 to 4 fl. oz.	601
,, ,, *Compositum*		601
,, ,, *Tartarisatum*		601
,, *Ispaghulæ*	½ to 2 fl. oz.	693
,, *Papaveris*		857
,, *Quercus*	1 to 2 fl. oz.	979
,, *Sappan*	½ to 2 fl. oz.	1054
,, *Sarsæ Compositum*		1057
,, *Sarsaparilla Compositum*		1057
,, *Scoparii*		1067
,, *Taraxaci*		1195
,, *Tritici*	4 to 8 fl. oz.	1220
,, *Ulmi*	2 to 4 fl. oz.	1221
,, *Uvæ Ursi*		1227
,, *Zittmanni Fortius*		1057
,, ,, *Mitius*		1057
Dedaleira		475
Delphinina		1154
Delphinine	$\frac{1}{60}$ gr.	1154
Depilatory		221
Dermatol		256
Destillirte Wasser		181
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Dextroform		546
Di-Acetyl Morphine		778
,, ,, *Hydrochloride*	$\frac{1}{24}$ to $\frac{1}{6}$ gr.	778
,, *Tannin*		88
Diachylon Plaster		917
Dialysed Iron		525
Diaphtherin		991
Diaphthol		991
Diastase, Malt		271
Dibromogallic Acid		47
Diente de Leon		1194
Diethylamide Valerianate		1229
Diethylbarbituric Acid		1225
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,, *Ferri Quininæ et Strychninæ Phosphatum* . . . 1 fl. drm. 528
,, *Glusidi* . . . 5 to 20 min. 566
,, *Guaranæ* . . . 30 to 120 min. 588
,, *Heroin cum Terpene* . . . $\frac{1}{2}$ to 2 drm. 779
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,, ,, ,, *Quininæ* . . . 873
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,, *Sennæ*	1 to 3 fl. drm.	1076
,, *Simplex*	20 to 60 min.	209, 873
,, *Sodii Cacodylatis*		1104
,, *e Succo Glycyrrhizæ*		574
,, ***Taraxaci Compositum***		1195
,, *Thyroidei*	1 to 2 fl. drm.	1214
,, *Valerianæ*		1233
,, *Viburni Prunifolii*	1 fl. drm.	1233
,, ,, ,, *Compositum*		1233
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,, ,, *Mynsicht's*		83
Ellagic Acid		47
Embelia	60 to 240 gr.	482
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,, *Hydrobromidum*		691
Emetine (Extract)		691
,, *(Impure)*		691
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,, *de Cantaride mite*		320
,, ***Diachilon Gommoresinoso***		918
Emplasto Aglutinante		907
,, *de Galbano Azafranado*		550
,, ,, *Jabon*		1050
,, ,, *Plomo Gomado*		918
,, *Simple*		918
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,, *de Sabao*		1050
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,, ,, ***et Belladonnæ***		95
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,, *Album*		630
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,, *Calomelanos*		630
,, ***Cantharidini***		320
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,, ,, *Colatum*		320
,, ***Cantharidum Perpetuum***		320
,, ,, *pro usu veterinario*		320
,, *Canth. cum Euphorbio*		320
,, *Capsici*		325
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,, *Fuscum Camphoratum*		918
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,, Plumbi		917
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,, *Bromoformi*	5 to 20 min.	264
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,, *Chloroformi*		378
,, *Hydrocyanata*		155
,, *Iodoformi*		664
,, *Magnesiæ*		755
,, *Morrhuæ Pancreatica*		793
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,, ,, ***Jecoris***		795
,, ***Myrrhæ Ferrata***		512
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,, ,, ,, *Composita*	2 to 8 fl. drm.	794
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Ferrum *Sesquichloratum Crystallisatum*		521
,, *Subcarbonicum*		511
,, *Sulphuricum Præcipitatum*		530
,, Tartaratum	5 to 10 gr.	537
Fersan	10 to 30 gr.	508
Festes Paraffin		858
Feto Macho		539
Feuille de Coca		400
Feuilles de Belladone		224
,, ,, *Bucco*		265
Fève du Calabar		886
,, *de St. Ignace*		658
Fibrolysin		1085
Fichi		538
Fichtenharz		906
Ficus		538
Fierro		504
Figos Passados		538
Figs		538
Figue		538
Filicic Acid		540
Filix Mas		538
Filmogen		977
Fingerhutblatter		473
Finocchio		540
Fish Glue		655
Fleming's Tincture of Aconite		94
Flexible Collodion		977
Flor de Couso		471
Flores Koso		471
,, *Kusso*		471
Floridcina		882
Flowers of Sulphur		1178
Fluid Magnesia		751
Fluidextractum Aconiti		94
,, *Apocyni*	15 min.	177
,, *Arnicæ Radicis*		193
,, *Berberidis*	20 to 60 min.	242
,, *Buchu*		266
,, *Calumbæ*		297
,, *Cannabis Indicæ*		317
,, *Cassiæ Beareanæ*	30 to 60 min.	345
,, *Caulophylli*	30 to 60 min.	349
,, ,, *Composita*	30 to 60 min.	349
,, *Chiratæ*		361
,, *Cissampeli*	30 to 120 min.	867
,, *Colchici Seminis*		431
,, *Collinsoniæ*	15 to 60 min.	433
,, *Convallariæ*	8 min.	443
,, *Coto*	5 to 20 min.	450
,, *Cubebæ*	5 to 30 min.	464
,, *Cypripedii*	15 min.	473
,, *Digitalis*	1 to 2 min.	478
,, *Dulcamaræ*	30 to 60 min.	480
,, *Ergotæ*		487
,, *Eucalypti*		498
,, *Euonymini*		500
,, *Eupatorii*	20 to 60 min.	501
,, *Frangulæ*	15 min.	1011
,, *Gelsemii*	1 min.	560
,, *Gentianæ*		562
,, *Glycyrrhizæ*		572
,, *Granati*		578
,, *Grindeliæ*		580
,, *Guaranæ*	30 min.	588
,, *Hyoscyami*		646
,, *Jambul*	10 to 60 min.	705
,, *Juglandis*		706
,, *Kavæ*	15 to 60 min.	710
,, *Kolæ*		712
,, *Krameriæ*		714
,, *Lachnanthes*		716
,, *Leptandræ*	15 min.	721
,, *Lobeliæ*		741
,, *Lupulini*	5 to 15 min.	744
Fluidextractum Malti		270
,, *Matico*		761
,, *Mezerei*		776
,, *Phytolaccæ Radicis*	1 to 5 min.	892
,, *Pilocarpi*		697
,, *Podophylli*		923
,, *Pruni Virginianæ*	½ to 1 fl. drm.	970
,, *Quassiæ*		979
,, *Quebracho*		979
,, *Rhamni Frangulæ*	1 to 4 fl. drm.	1011
,, ,, *Purshianæ Aromaticum*		339
,, *Rhei*	15 min.	1016
,, *Rhus*		1018
,, *Rosæ*		1022
,, *Salicylis Nigræ*	30 to 60 min.	1037
,, *Sarsaparillæ Compositum*		1056
,, *Scillæ*	1½ min.	1065
,, *Scopola*		1069
,, *Scutellariæ*	½ to 1 fl. drm.	1069
,, *Senegæ*		1071
,, *Sennæ Fructuum*		1076
,, *Serpentariæ*		1078
,, *Stillingiæ*	30 min.	1154
,, *Stramonii*		1156
,, *Sumbul*		1182
,, *Trifolii*		1218
,, *Tritici*	2 fl. drm.	1220
,, *Uvæ Ursi*		1227
,, *Valerianæ*	30 to 60 min.	1230
,, *Veratri Viridis*		1231
,, *Viburni Opuli*		1234
,, ,, *Prunifolii*		1234
,, *Vincæ Majoris*	1 to 2 fl. drm.	1235
,, *Yerbæ Santæ*	10 to 60 min.	1237
Fluorescein		1010
Fluoroform		56
Fluorrheumin		56
Fœniculi Fructus		540
Foglia di Coca		400
Foglie di Belladonna		224
Folia Juglandis		706
,, *Nicotiana*		1190
,, *Stramonii Nitrata*		1156
Folium Cocæ		400
Formaldehyde Ichthyolsulphonate		658
Formaldehydum Solutum		542
Formalin		542
Formic Acid		44
,, *Aldehyde*		542
Formicin		547
Formin		545
Formol		542
Fortoin	1 to 5 gr.	450
Fosfato Bicalcico		293
,, *Bisodico*		1123
,, *di Calcio*		292
,, *Di-Calcico*		293
,, *Ferroso-Ferrico*		527
,, *de Hierro*		527
,, *Sodico*		1123
,, *Tri-Calcico*		293
Fosforo		883
Fothergill's Mixture	½ oz.	1066
Fougère		539
Fowler's Solution		17
Frankincense		1207
French Mixture		671
Freres Come's Arsenical Paste		19
Friar's Balsam		240
Fructus Cannabis		315
,, *Petroselini*		176
,, *Rhamni Catharticæ*		1011
Fuco Carageo		359
Fucus Vesiculosus		548
Fuller's Earth		129

	Dose.	Page
Fulmi-coton		975
Fuming Nitric Acid		62
Funcho		540
Furonculine		1236
Fusain Noir Pourpré		499
Gaiacol		584
Galbano		548
Galbanum	5 to 15 gr.	548
Galena		910
Galha		551
Galipeine		469
Galipidine		469
Galla	10 to 20 gr.	550
Gallacetophenone		73
Gallanol		46
Gallapel		550
Galle d'Alep		550
Gallic Acid		45
,, ,, *Anilide*		46
Gallobromol	8 to 16 gr.	47
Galloformin		46
Gallogen		47
Gallussaure		45
Gamboge		303
Gamgee Tissue		575
Garcinia Purpurea		552
Gargarisma Acidi Carbolici		34
,, ,, *Chromici*		39
,, ,, *Tannici*		87
,, *Aluminis*		127
,, *Boracis*		261
,, *Chlori*		371
,, *Myrrhæ (Squire)*		803
,, *Potassii Chloratis*		947
,, ,, *Permanganatis*		962
,, *Resorcini*		1010
Gargarisme au Chlorate de Potassium		947
Garofani		333
Gastric Antacid Lozenge		246
Gaze Iodoformeé		663
Gaultheriæ Oleum	5 to 15 min.	552
Gauze, Alembroth		626
,, *Benzoic*		22
,, *Boric*		26
,, *Carbolic*		35
,, *Cyllin*		472
,, *Eucalyptus*		498
,, *Iodoform*		663
,, *Mercury Zinco-cyanide*		608
,, *Salicylic*		77
,, *Sozoiodol*		1138
,, *Sublimate*		625
,, *Thymol*		1210
Guyaba del pais		1226
Gayuba		1226
Gaze Boriquée		26
,, *Phénolée*		35
Gebrannte Magnesia		745
Gebrannter Gips		294
Gelanthum		1218
Gelatina Carrageen		359
,, *Cetrariæ*		359
,, *de Peixe*		655
Gelatin Basis for Pessaries and Suppositories		556
Gelatine Officinale		556
Gelatinum		555
,, *Glycerinatum*		557
,, *Zinci*		1248
,, ,, *Durum*		1248
Gelato-Glycerin		557
Gelatose Silver		187
Gelatum Ichthyol		657
Gelbes Quecksilberoxyd		617
Gelbes Wachs		349

	Dose.	Page
Gelsemic Acid		559
Gelsemii Radix		557
Gelsemin	$\frac{1}{2}$ to 2 gr.	559
Gelseminæ Hydrochloridum	$\frac{1}{120}$ to $\frac{1}{30}$ gr.	559
Gelsemine	$\frac{1}{120}$ to $\frac{1}{32}$ gr.	559
Gelseminine		559
Gelsemininum Hydrochloricum Cryst.		559
Gelsemio		557
Gelsemium		557
Gelsemiumwurzel		557
Genciana		561
Gengibre		1256
Genièvre		707
Gentianæ Radix		561
Gentiopicrin		561
Genziana		561
Geoform		586
Geosote		586
Gepulvertes Eisen		503
Geranial		727
Geraniol		727
Gerbsaure		84
Gereinigte Baumwolle		575
Gereinigter Honig		762
Gereinigtes Schwefelantimon		171
German Silver		807
Gesso Calcinato		294
Gewürznelken		333
Gialappa		700
Gilmour's Pills		478
Gingembre		1256
Ginger		1256
,, *Essence of*		1257
Gingerine		1257
Girofle		333
Giusquiamo		644
Glacial Acetic Acid		11
Glacialine		26
Glandulæ Rottleræ		708
,, *Suprarenales*	5 gr.	1184
Glicerina		566
,, *Boratada*		261
,, *Borica*		25
Glicerofosfato de Cal		284
,, *di Calcio*		284
Globules Atoxyl	¼ gr. in each	1105
,, *Sodii Cacodylatis*		1104
Glonoin		808
Glucantha		1218
Glucose, Diluted		564
,, *Liquid*		563
Glucusimide		564
Glusidum	$\frac{1}{2}$ to 2 gr.	564
Glutanol	5 to 15 gr.	88
Glutol		546
Glycaphorm		780
Glycerado de Almidon		160
,, *Commun*		160
Glycéré d'Amidon		160
,, *d'Oxide de Zinc*		1248
Glycerin *Extract of Red Bone Marrow*		761
,, *and Lime Juice*		150
,, *of Phenol*		33
,, *with Rose Water*		570
,, Suppositories		569
Glycerinated Vaccine Lymph		1268
Glycerinphosphorsaures Calcium		284
Glycerine Officinale		566
Glycerinum	1 to 2 fl. drm.	566
,, *Acetomorphinæ*		780
,, Acidi Borici		25
,, ,, Carbolici		33
,, ,, *Salicylici*		77
,, ,, Tannici		86
,, Aluminis		127

	Dose.	Page
Glycerinum Amyli		160
,, *Atropinæ*		204
,, *Belladonnæ*		236
,, *Bismuthi Carbonatis*		246
,, Boracis	½ to 1½ fl. drm.	261
,, *Carmini*		421
,, *Cocci*		421
,, *Croci*		459
,, *Ferri Perchloridi*		526
,, *Glycerophosphatum Compositum*		285
,, *Heroinæ Compositum*		780
,, *Hydrastis*		638
,, *Hypophosphitum*		291
,, *Iodi*		671
,, *Iodoformi*		664
,, *Ipecacuanhæ*		689
,, *Pancreatin*		854
,, *Papain*		856
,, Pepsini	1 to 2 fl. drm.	872
,, ,, *Fortius*		873
,, Plumbi Subacetatis		920
,, *Resorcini*		1010
,, *Sodii Cinnamatis*		1114
,, *Thymol Alkalinum*		1209
,, ,, *Compositum*		1209
,, Tragacanthæ		1217
Glyceritum Amyli		161
,, *Bismuthi*		254
,, *Boroglycerini*		25
,, *Ferri Quininæ et Strychninæ Phosphatum*	15 min.	529
,, *Hydrastis*	30 min.	638
,, *Vitelli*		847
Glycerol		566
,, *Bismuthi Nitratis*		256
,, *-ester of Guaiacol*		587
,, *Glycerophosphatis*		285
,, *Hypophosphitis*		291
,, *of Pancreatin*		854
Glycerola Hypophosphitum (Squire)	1 to 2 fl. drm.	291
Glycerolado de Almidon		161
Glycerolato d'Amido		160
Glycerole of Ipecacuanha		689
,, *Papain*		856
,, *of Pepsin*		873
Glycérophosphate de Calcium		284
,, *Basique de Quinine*		984
Glyceryl Trinitrate		808
Glyco-gelatin		556
,, *-gelatinum*		556
Glycosal	5 to 30 gr.	79
Glycyrrhizæ Radix		570
Glycyrrhizin		570
Glycyrrhizinum Ammoniatum		574
Glymol		860
Goa Powder		183
Gold and its preparations. See also Aurum		212
,, *Bromide*		212
,, *Tribromide*		212
,, *and Sodium, Chloride of*		212
Goldschwefel		171
Goma Amoniaco		129
,, *Arabiga*		1
,, *Guta*		304
,, *de Limon*		482
Goma-resina Ammoniaco		129
Gomma Ammoniaco		129
,, *Arabica*		1
,, *Gotta*		303
,, *Guta*		304
Gomme Adracanth		1216
,, *Amoniaque*		129
,, *Arabique vraie*		1
,, *Gutte*		303
Goma Tragacanto		1216
Gonal		1044
Gonoral		1044
Gossypii Radicis Cortex		575
Gossypium		575
,, *Aluminis*		127
,, *Capsici*		325
,, *Depuratum*		575
,, *Ferratum*		534
,, *Fulminans*		975
,, *Hamamelis*		595
,, *Iodatum*		671
,, *Iodoformi*		664
,, *Krameriæ*		715
,, *Menthol*		771
,, *Purificatum*		575
Goudron de Houille		907
,, *végétal*		908
Goulard Water		920
Goulard's Extract		919
,, Lotion		920
Graisse de Laine		100
Grama Franceza		1220
Granado		577
Granati Cortex		576
Granatrinde		576
Granula Dioscoridis		19
Granules de Digitaline Cristallisée		479
Grasa de Cerdo		98
Grasso di Montone		1078
,, *Suino*		98
,, *con Benzoino*		100
Greater Celandine		360
,, *Periwinkle*		1235
Gregory's *Pill*		435
,, Powder		1014
,, ,, *Improved*		1015
Grenadier		577
Grey *Oil*		605
,, Powder		633
Griffith's Mixture		512
Grindelia		579
Ground-nut Oil		827
Guacamphol		585
Guaiacetin	4 to 8 gr.	586
Guaiaci Lignum		580
,, Resina	5 to 15 gr.	581
Guaiacol	1 to 5 min.	451, 584
,, *Benzoate*	5 to 10 gr.	585
,, *Cacodylate*		587
,, *Camphorate*	5 gr.	585
,, *Carbonate*	3 to 10 gr.	585
,, *Cinnamate*	5 gr.	586
,, *Phosphate*	1½ to 3 gr.	586
,, *Phosphite*	5 to 10 gr.	586
,, *Salicylate*		587
,, *Salol*		587
,, *(Synthetic)*	1 to 5 gr.	585
,, *Valerianate*	2 to 3 min.	586
Guaiacol-Anytol		658
Guaiacyl		586
Guaiaform		586
Guaiaquin		587
Guaiamar	5 to 10 gr.	587
Guaiaperol		904
Guaiasanol		587
Guaikinol		587
Guajacum		580
Guajakharz		581
Guajakholz		580
Guarana	10 to 60 gr.	587
Guaranine		587
Guimauve		124
Gum Acacia		1
Gum Pastes (Unna)		4
Gummi Guttæ		303

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Gummi Indicum 588
,, *Resina Gutta* 304
,, *Rubrum* 492
Gummigutt 303
Gun Cotton 975
Gurjun Balsam 213
Gutagamba 303
Gutta Percha 589
,, ,, *Depurata* 589
,, ,, *Laminata* 589
Guttæ Atropinæ Sulphatis 204
,, ,, *cum Cocaina* 204
,, *Cocainæ Hydrochloridi* 412
,, ,, *Oleosæ* 405
,, *Creosoti (Squire)* 454
,, *Cupri Sulphatis* 468
,, *Daturinæ* 1157
,, *Euphthalminæ Hydrochloridi* 205
,, *Gummi* 304
,, *Homatropinæ* 600
,, ,, *cum Cocaina* 600
,, *Hydrogenii Peroxidi* 643
,, *Hyoscinæ* 652
,, ,, *et Cocainæ* 652
,, *Physostigminæ* 890
,, ,, *cum Cocaina* 890
,, *Pilocarpinæ* 895
,, *Scopolaminæ* 652
,, *Zinci Chloridi* 1244
,, ,, ,, *cum Cocaina* 1244
Gutti 304
Gutzeit's Test, Modified 1316
Guy's Pills 478
Gynecol and Enicol Pancreaticus Fort. (Squire) 854
Gynocardiæ Oleum 589
Gynocardin 589

Haba del Calabar 886
,, ,, ,, *S. Ignacio* 658
Hæmatein 592
Hæmatogen 593
Hæmatoxyli Lignum 591
Hæmatoxylin 592
,, *Solution* 1309
Hæmogallol 1 to 5 gr. 593
Hæmoglobin 593
,, *Colloidal* 593
,, *Scales* 593
Hæmol 3 to 8 gr. 593
Hæmostatic Collodion 977
Hamamelidis Cortex 594
,, Folia 595
Hamamelin 1 to 5 gr. 595
Hamamelis 593
Hamilton's Pill 435
Hammeltalg 1078
Hard Paraffin 858
,, Soap 1048
Hartshorn and Oil 144
Hausenblase 655
Hausseife 1047
Haustus Ammonii Chloridi 146
,, *Apomorphinæ Compositus* 180
,, *Chloralamidi* 368
,, *Copaibæ* 447
,, *Trinitrini* 809
Hazeline 596
Hebra's Ointment 918
Hedonal 15 to 30 gr. 1226
Heim's Pill 478
Helecho Macho 539
Helenin ¼ to 2 gr. 660
Hellebore, White 596
,, *Green* 1231
Helleborein 596
Helleborin 596
Helleborus 596
Helmitol 10 to 15 gr. 547
Hemidesmi Radix 596
Hemlock Fruit 439
,, Leaves 438
Hemp, *Canadian* 177
,, Indian 314
Henbane Leaves 644
Hepar Sulphuris 932
Hermophenyl 607
Heroin 778
,, *Hydrochloride* 778
Heronium hydrochloricum 778
Heto-Cresol 1114
Hetoform 1114
Hetol 1113
,, *Caffeine* 1114
Hetralin 547
Hexahydropyrazine 904
Hexamethylenetetramine 5 to 15 gr. 545
Hexanitrin 760
Hidrastis del Canada 634
Hidrato de Cloral 362
,, *Potasico* 927
,, *Sodico* 1086
Hiel de toro 503
Hiera Picra 124
Hierro 503
,, *Reducido por el Hidrogeno* 534
Higos 538
Himrod's Cure 1156
Hinojo 540
Hipoclorito Calcico Clorurado 299
,, *de Calcio Impuro* 299
,, ,, *Sodio liquido* 301
Hipofosfito Calcico 289
,, *Sodico* 1116
Hirudines 598
Hirudo 597
Hoffmann's Anodyne 106
Hoja de Belladona 224
,, ,, *Digital* 473
,, ,, *Nogal* 706
,, ,, *Taraxacon* 1193
Holocaine 416
,, *Hydrochloride* 416
Hollow Suppositories 1183
Holunderblüthen 1040
Holzkohle 326
Holztheer 908
Homatropina 600
Homatropinæ Hydrobromidum $\frac{1}{50}$ to $\frac{1}{20}$ gr. 598
,, *Hydrochloridum* 600
,, *Salicylas* 600
Honey, Clarified 762
Honthin 10 to 30 gr. 88
Hopfen 742
Hopogan 848
Hops 742
Hordeum Decorticatum 601
Horseradish Root 191
Houblon 742
House Pill 630
Household Ammonia 135
Huile. See Olea 824
,, *d'Amande* 151
,, *de Cade* 271
,, ,, *Croton* 459
,, Grise 605
,, *de Foie de Morue* 790
,, ,, ,, ,, ,, *Créosotée* 795
,, ,, ,, ,, ,, *Phosphorée* 795
,, ,, *Jusquiame* 648
,, ,, ,, *Composée* 648

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Huile Lourdes de Petrole 860
,, *d'Olive* 824
,, ,, *purifiée et sterilisée* 825
,, *de Ricin* 1018
,, ,, *Vaseline* 860
,, *Volatile de Cajeput* 278
,, ,, ,, *Menthæ Verte* 768
Humanising Milk Powder 854
Humulus 742
Hutchinson's Pills 634
Huxham's Original Formula for Tincture of Cinchona Bark 391
Hydracetin 8
Hydrargyri *Benzoas* 606
,, Bichloridum 621
,, *Carbolas* 606
,, Chloridum 626
,, ,, *Corrosivum* 623
,, ,, *Mite* 627
,, *Cyanidum* 1/16 to 1/8 gr. 607
,, *Ethylenediamine Citras* 608
,, *Gallas* ¼ to 1 gr. 608
,, Iodidum Rubrum 1/32 to 1/16 gr. 610
,, ,, *Viride* 1/6 to 2 gr. 612
,, *Naphtholacetas* ½ to 1 gr. 608
,, Nitratis Liquor Acidus 613
,, *Nucleinas* 810
,, Oleas 616
,, ,, *c. Morphina* 617
,, Oxidum Flavum 617
,, ,, Rubrum 619
,, *Oxycyanidum* 608
,, Perchloridum 1/32 to 1/16 gr. 621
,, *Persulphas* 609
,, *Phenas* 606
,, *et Potassii Iodidum* 612
,, *Salicylas* 608
,, *Sozoiodolas* 1138
,, Subchloridum ½ to 5 gr. 626
,, *Succinimidum* 1/8 to ¼ gr. 609
,, *Sulphas* 609
,, *Tannas* 1 to 2 gr. 609
,, *Thymolacetas* ¼ to 1 gr. 610
,, *Zinco-cyanidum* 608
Hydrargyrol 607
Hydrargyrum 601
,, *Amidato-bichloratum* 631
,, Ammoniatum 631
,, *Bichloratum* 623
,, ,, *Ammoniatum* 631
,, ,, *Corrosivum* 623
,, *Biniodatum* 611
,, *Carbolicum* 1/3 to ½ gr. 606
,, *Chloratum* 627
,, ,, *Levigatum* 627
,, ,, *Mite* 627
,, ,, *Vapore Præparatum* 627
,, c. Creta 1 to 5 gr. 633
,, *Cyanatum* 607
,, *Iodatum* 613
,, ,, *flavum* 613
,, *Oxydatum* 619
,, ,, *Flavum* 617
,, ,, *viâ Humidâ Paratum* 617
,, ,, *Levigatum* 619
,, ,, *Rubrum* 619
,, *Præcipitatum Album* 631
,, *Tannicum Oxydulatum* 610
Hydras Chlorali 363
,, *Chloraticus* 363
,, *Kalicus* 928
,, *Natricus* 1086
Hydrastin 2 to 6 gr. 638
Hydrastina ¼ to ½ gr. 638
Hydrastinæ Hydrochloridum ½ to 1 gr. 639

Dose. Page
Hydrastinina 639
Hydrastininæ Hydrochloridum ½ to 1½ gr. 639
Hydrastis Rhizoma 634
Hydrato de Chloral 362
,, ,, *Quinine* 981
,, of Potassium 927
Hydrato-carbonas Ferrosus Saccharatus 511
,, *Plumbicus* 914
Hydrato *de Chloral* 363
,, ,, *Potassa* 928
,, *Potasico* 927
,, *de Soda* 1086
,, ,, ,, *Liquido* 1086
Hydriodic Acid 47
,, *Ether* 111
Hydrobromate of Homatropine 598
,, ,, Hyoscine 649
Hydrobromic Acid, Diluted 47
,, *Ether* 109
Hydrocarbonate de Magnésium 748
Hydrochloras Chinini 992
Hydrochloric Acid 50
,, ,, Diluted 52
,, *Ether* 110
,, *Solution of Arsenic* 18
Hydrocyanic Acid, Diluted 53
,, ,, *Scheele* 55
Hydrofluoric Acid 55
Hydrogen Borate 22
Hydrogenii Peroxidum 640
Hydrogenium hyperoxydatum Solutum 641
Hydronaphthol 807
Hydroxide de Calcium 286
,, ,, *Magnesium* 746
,, ,, *Potassium officinal* 927
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Lavandulæ Oleum.	½ to 3 min.	719
Lavendelöl		719
Lavement Purgatif		1076
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Leberthran		790
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,, ,, *Dried*		722
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Lenitive Electuary		1074
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,, ,, *Guayaco.*		580
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Lin		729
Linalool		719
Linalyl Acetate		719
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,, *Acetomorphinæ*		780
,, *Ammoniæ*		143
,, *Boracinus*		261
,, *Codeinæ*		425
,, *Heroin*	½ to 2 fl. drm.	780
,, *Ipecacuanhæ*		689
,, *Morphinæ (Squire)*		787
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,, ,, *et Chloroformi*		95
,, ,, *Compositum*		95
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,, *Atropinæ*		204
,, ,, *et Chloroformi*		204
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,, ,, *cum Chloroformo*		236
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,, *Acid Tartrate*	15 to 30 gr.	905
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,, Levis	5 to 30 gr. (repeated) 30 to 60 gr. (single)	745
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,, Ponderosa	5 to 30 gr. (repeated) 30 to 60 gr. (single)	747
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Myristica . . . 5 to 15 gr. 797
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Myrobalanum . . . 30 to 60 gr. 797
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Naftalan . . . 804
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Naphthalene . . . 803
Naphthalini Tetrachloridum . . . 2 to 10 gr. 804
Naphthalinum . . . 2 to 5 gr. 803
,, *Præcipitatum* . . . 803
Naphthalol . . . 2 to 8 gr. 806
Naphthol . . . 3 to 10 gr. 804
,, *Camphor* . . . 807
Naranja Amara . . . 206
Narceina . . . ½ to 1 gr. 844
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Narcyl . . . 1 to 1½ gr. 844
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,, ,, *Solutum* . . . 1086
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,, ,, *Siccum* . . . 1130
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Natriumbromid . . . 1100
Natriumcarbonat . . . 1107
Natriumchlorid . . . 1109
Natriumhypophosphit . . . 1116
Natriumjodid . . . 1118
Natriumphosphat . . . 1123
Natriumsalicylat . . . 1126
Natriumsulfat . . . 1130
Nebula Acidi Tannici . . . 87
,, *Adrenalini (Squire)* . . . 1187
,, *Adrenine* . . . 1187
,, ,, *cum Cocaina* . . . 1188
,, *Alkalina* . . . 1100
,, ,, *Composita* . . . 1100
,, *Antiseptica Alkalina* . . . 261
,, *Cocaine* . . . 412
,, ,, *Composita* . . . 405
,, ,, *Oleosa* . . . 405
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,, *Guaiacol et Menthol* . . . 585
,, *Iodi Composita* . . . 671
,, ,, *et Mentholis* . . . 671
,, *Iodoformi* . . . 664
,, *Menthol* . . . 772
,, ,, *cum Cocaina* . . . 772
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,, *Sodii Chloridi Composita* . . . 1112
,, *Suprarenalin et Cocaine* . . . 1187
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Neem Bark . . . 213
Nelkenol . . . 334
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Niccoli Bromidum . . . 1 to 5 gr. 807
,, *Sulphas* . . . ½ to 1 gr. 808
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,, *Carbonyl* . . . 808
Nicotine . . . 1190
,, *Salicylate* . . . 1190
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,, *Mercurico* . . . 613
,, ,, *Acido* . . . 613
,, ,, *Liquido* . . . 613
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,, *Vomica* . . . 810
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,, *Cubebæ* . . . 5 to 30 min. 464
,, *Lupulini* . . . 1 to 5 gr. 744
,, *Piperis* . . . ½ gr. 903
,, *Zingiberis* . . . 1257
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,, Amygdalæ . . . 1 to 4 fl. drm. 150
,, ,, *Amaræ Essentiale* . . . 152
,, ,, *Essent. Persic.* . . . 152
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,, *Chloroformi* . . . 375
,, *Cinereum* . . . 1 to 2 min. 605
,, Cinnamomi . . . ½ to 3 min. 397
,, *Citri* . . . 723
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,, *Gynocardiæ* . . . 589
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,, ,, *Compositum* . . . 648
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,, ,, *Infusum* . . . 648
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,, ,, ,, *cum Iodeto Ferroso* . . . 791
,, ,, ,, *Ferratum* . . . 790
,, ,, *Iodetum* . . . 791
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,, ,, Empyreumaticum . . . 271
,, *Laurocerasi* . . . 718
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,, Limonis . . . ½ to 3 min. 722
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,, ,, *Lotum* . . . 731
,, *Lubricans* . . . 35
,, *Macidis* . . . 799
,, *Menthæ* . . . 765
,, ,, *Crispæ* . . . 768
,, ,, Piperitæ . . . ½ to 3 min. 764
,, ,, Viridis . . . ½ to 3 min. 768
,, Morrhuæ . . . 1 to 4 fl. drm. 790
,, Myristicæ . . . ½ to 3 min. 799
,, *Myristicæ Ætherum* . . . 799
,, ,, *Expressum* . . . 800
,, *Neroli* . . . 211
,, *Nucistæ* . . . 800
,, Olivæ . . . ½ to 1 fl. oz. 824
,, *Olivarum Commune* . . . 825
,, Phosphoratum . . . 1 to 5 min. 884
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,, ,, *Rectificatum* . . . 909
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,, Pini . . . 1 to 5 min. 900
,, ,, *Foliorum* . . . 901
,, ,, *Sylvestris* . . . 901
,, *pro Nebula* . . . 862
,, Ricini . . . 1 to 8 fl. drm. 1018
,, ,, *Aromaticum* . . . 1021
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,, *Succini Rectificatum* . . . 1 to 3 min. 1172
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,, ,, *Depuratum* . . . 1199
,, ,, *Rectificatum* . . . 1199
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,, *Thymi* . . . 1210

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,, ,, *Ricino* . . . 1018
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,, ,, *Liquidum* . . . 956
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,, Peel, Bitter . . . 206
,, Wine . . . 207
Orchitic Fluid, Brown-Sequard's . . . 1139
Orexin . . . 1 to 5 gr. 846
,, *Hydrochloride* . . . 2 to 8 gr. 846
,, *Tannate* . . . 5 to 10 gr. 846
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Orthobenzoicsulphinide . . . 564
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,, *Hydrochloride* . . . 1 to 5 gr. 416
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,, ,, *Magnesio* . . . 745
,, *Mercurico Giallo* . . . 617
,, ,, *Rosso* . . . 619
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Ostindischer Enzian . . . 360
Otto of Rose . . . 1023
Ouabain . . . 1165
Ourouparia Gambir . . . 348
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Oxaphor . . . 313
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,, *de Fierro Dialisado* . . . 525
,, *Magnesico* . . . 745
,, *Mercurico* . . . 619
,, ,, *Amarillo* . . . 617
,, ,, *Rojo* . . . 619
,, *de Plomo* . . . 917
,, ,, *Potasio* . . . 928
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Oxycamphor	15 to 30 gr.	313
Oxychinaseptol		991
Oxyde d'Argent		190
,, *de Calcium*		298
,, ,, *Magnesium*		745
,, ,, *Mercure Jaune*		617
,, ,, ,, *Rouge*		619
,, *Plomb Fondu*		916
,, ,, *Zinc*		1245
Oxydo de Chumbo		917
,, *Mercurico*		619
Oxydum Hydrargyri Flavum		617
,, ,, *Rubrum*		619
,, *Hydrargyricum*		619
,, ,, *Flavum*		617
,, ,, *Præcipitatum*		617
,, *Magnesicum Ponderosum*		748
,, *Plumbicum*		917
,, ,, *Semivitreum*		917
,, *Stibicum*		169
Oxygen		847
Oxyhæmoglobin		593
Oxymel	1 to 2 fl. drm.	763
,, *Ipecacuanhæ*		690
,, Scillæ	½ to 1 fl. drm.	1064
,, *Urgineæ*		1064
,, *de Verdete*		465
Oxysantonin		1046
Oxysparteina		1068
Oxysparteine Hydrochloride		1068
,, *Sulphate*		1068
Ozone		848
Ozonic Ether		641
Palo de Campeche		591
Panama Bark		980
Pancreas Enzymes		848
Pancreatic Diastase		851
,, *Emulsio*	1 to 4 fl. drm	855
Pancreatic Solution		849
Pancreatin		849
Pancreatina		850
,, *Medicinale*		850
Pancreatinum		849
Pancreatised Fat	1 to 4 fl. drm.	855
Pankreatinum		850
Papain	2 to 10 gr.	855
Paparerina	1/12 to ⅓ gr.	845
Papaveris Capsulæ		857
Papavero		857
Papaw Juice		855
Papayotin		855
Papel Sinapico		1082
Para-aminobenzoyl-diethylamino-ethanol Hydrochloride		418
Paracotoin	2 to 3 gr.	450
Paracresotinic Acid		44
Para-cresylic Acid		42
Para-diethoxy-ethenyl-diphenylamidine		416
Paraffin Injections		858
,, *Oxygenated*		864
Paraffina Mollis		862
Paraffine		858
Paraffinum		858
,, *Carbolisatum*		34
,, Durum		858
,, Liquidum		860
,, *Massa*		863
,, Molle		862
,, *Solidum*		858
Paraform		545
Paraformic Aldehyde		545
Paraldehydum	½ to 2 fl. drm.	865
Paraldeida		865
Para-Monochlorophenol		36

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Paraphenetidin Aceto-Salicylate		876
,, *Agarate*		876
,, *Amygdalate*		875
,, *Camphorate*		876
,, *Citrate*		875
,, *Lactate*		876
,, *Methyl Glycollate*		876
,, *Salicylate*		876
,, *Quinine-ethyl Carbonate*		876
,, *Vanillin-ethyl Carbonate*		876
Paregoric		309
,, *Elixir*		309
,, *Scotch*		841
Pareiræ Radix		867
Parenol		863
,, *Beeswax*		863
,, *Liquid*		863
,, *Spermaceti*		863
,, *Wool Fat*		863
Parogen Guaiacolis		585
,, *Ichthamolis*		657
,, *Iodi*		673
,, *Liquid*		864
,, *Salicylatum*		78
Parogenum		864
,, *Chloroformi Camphoratum*		378
,, *Creosoti*		455
,, *Empyreumaticus*		271
,, *Eucalyptolis*		498
,, *Hydrargyri*		606
,, *Iodi Dilutum*		673
,, *Iodoformi*		665
,, ,, *Deodoratum*		665
,, *Mentholis*		772
,, *Naphtholis*		806
,, *Picis*		910
,, *Spissum*		864
,, *Sulphuris*		1180
,, ,, *Compositum*		1180
,, *Terebinthinæ*		717
Paroleine		860
Parrish's Chemical Food (Squire)		530
Pasta Acidi Salicylici		77
,, *Copaibæ*		448
,, *Hamamelidis*		596
,, *Ichthamolis*		657
,, ,, *Composita*		657
,, *Ichthyol*		657
,, *Iodi et Amyli*		671
,, *Londinensis*		1086
,, *Lubricans*		35
,, *Resorcini Fortior*		1010
,, ,, *Mitis*		1010
,, *Unna*		1248
,, *de Viena*		931
,, *Zinci Chloridi*		1244
,, ,, ,, *Composita*		1244
,, ,, ,, *et Ichthamolis*		1248
,, ,, *cum Resorcino*		1010
Pastillas de Altea		125
,, ,, *Azufre*		1177
Pastilles of Ammonium Bromide		139
Pastille of Eucalyptol		498
,, ,, *Eucalyptus*		498
Pastilles, Cyllin		472
,, *Schuster's*		87
Pastilli Heroin		780
,, *Hydrargyri Chlorati cum Talco*		630
,, *Ipecacuanhæ cum Opio*		787
,, *Opii et Ipecacuanha*		787
,, *Potassii Chloratis*		947
Pastillus Acetomorphinæ Compositus		780
,, *Acidi Borici*		26

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Pastillus Acidi Carbolici		35
,, *Aconiti*		95
,, *Apomorphinæ et Codeinæ*		180
,, *Bismuthi*		246
,, ,, *et Morphinæ*		246
,, *Cocainæ*		412
,, ,, *et Morphinæ*		412
,, *Codeinæ*		425
,, *Iodoformi*		664
,, *Ipecacuanhæ cum Opio*		787
,, *Menthol*		772
,, *Morphini Hydrochlorici*		787
,, *Sulphuris Compositus*		1177
Pâte de Lichen Officinal		359
,, ,, *Réglisse Officinale*		575
Pavot		857
Pary's Solution		468
Pea-nut Oil		827
Pearl Barley		601
Pearson's Antiseptic		43
,, *Cerate*		918
Pece di Borgogna		906
Pegu Catechu		348
Pelitre		973
Pelletierina		578
Pelletierine		578
,, *de Tanret*		579
Pelletierinæ Sulphas	6 gr.	579
,, *Tannas*	5 to 8 gr.	579
Pellitory Root		972
Pental		378
Pentasulfure d'Antimoine		171
Pepe Cubebe		462
Pepe Nero		902
Peperone		323
Pepper, Black		902
Peppermint, Oil of		764
Pepsina Medicinal		868
Pepsinum	5 to 10 gr.	868
,, *Saccharatum*		872
Peptonised Beef Jelly		855
,, ,, *Tea*		855
,, *Gruel*		855
,, *Milk*		854
,, *Milk-Gruel*		855
,, *Nutritive Enemata*		855
Peptonising Powder		854
,, *Powders and Tablets*		855
Percha Lamellata		589
Perchloride of Mercury		621
Percolation, process of		1215
Perhydrol		640
Periodotetrahydroparamethyloxychinolinum		1202
Peritre de Africa		973
,, *del Caucaso*		973
Permanganas Kalicus		960
Permanganate de Potassium		960
Permanganato Potasico		960
Peronine		780
Peru Balsam		214
Pervenche Officinale		1235
Pessary Basis		556
Pessus Acidi Tannici		87
,, *Aluminis*		127
,, ,, *et Zinci*		127
,, *Atropinæ*		204
,, *Coniinæ*		441
,, *Eucalypti*		498
,, *Plumbi Iodidi*		916
,, ,, ,, *et Atropinæ*		916
,, ,, ,, ,, *Opii*		916
,, *Quininæ*		994
,, *Zinci*		1248
,, ,, *Oxidi*		1248
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Petrolatum Molle		862
,, *Spissum*		858
Petroleum Benzin		237
,, *Ether*		237, 864
,, *Spirit*		864
Petrosulfol		658
Pez de Borgona		906
Pfefferminzol		764
Pharbitis Nil		708
Phellandrene		499
Phenacetinum	5 to 10 gr.	873
,, *cum Caffeina Effervescens*	60 to 120 gr.	875
Phenalgin	5 to 20 gr.	8
Phenate de Soude, Solution		35
Phenazonum	5 to 20 gr.	877
,, *Effervescens*	60 to 120 gr.	879
Phenocoll Hydrochloridum	5 to 10 gr.	876
,, *Salicylas*		877
Phenol		27
Phenol-Camphor		36
,, *Iodatum*		36
,, Liquefied		33
,, *Lozenge*		34
,, *Officinal*		27
,, *Ointment*		34
,, *ortho-Sulphonic Acid*		37
,, *Para-Sulphuric Acid*		37
,, *Sodique*		35
,, *Suppositories*		33
Phenoli Solutio seu Aqua Phenolata		33
Phenolphthalein		881
,, *Paper*		1312
,, *Solution*		1312
Phenosal	5 to 10 gr.	876
Phenosalyl		36
Phenyl-acetamide		5
Phenyldimethylpyrazolon		877
Phenyl *Dihydro-Quinazoline*		846
,, Salicylate		1037
,, *Urethane*	1 to 5 gr.	1226
Phesin		876
Phloridzin	5 to 15 gr.	882
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,, *Præcipitatus*		293
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,, ,, ,, ,, *Sodium*		1123
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,, Pill		885
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Phosphote		455
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,, *Salicylas*		891
,, Sulphas	$\frac{1}{60}$ to $\frac{1}{20}$ gr.	889
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Phytolaccin	¼ to ½ gr.	892
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,, ,, *Solution*		71
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,, ,, *et Belladonnæ et Nucis Vomicæ* 926
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,, ,, *et Nucis Vomicæ*		1016
,, Saponis Composita	2 to 4 gr.	838
,, Scammonii Composita	4 to 8 gr.	1060
,, Scillæ Composita	4 to 8 gr.	1064
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,, *de Podophylline Belladonées*		926
,, *de Ricord*		613
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,, *da Jamaica*		898
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,, *Sylvestris Oleum*		901
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Piper Nigrum		902
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,, *Quinate*	5 to 15 gr.	905
Piperidine		903
,, *Acid Tartrate*	10 to 15 gr.	904
,, *Guaiacolate*	5 to 30 gr.	904
Piperina	3 gr.	903
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Piscidia		905
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,, Burgundy		906
,, Plaster		906
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,, Carbonis Præparata		907
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,, *Solida*		908
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,, Carbonas		913
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,, *Lactas*		69
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,, *Aceticum*		912
,, ,, *Basicum Solutum*		919
,, ,, *Depuratum*		912
,, *Carbonicum*		914
,, ,, *Basicum*		914
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,, *Subaceticum Solutum*		919
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Pneumin	7½ to 30 gr.	455
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,, ,, *Ipecacuanha Composto*		688
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,, ,, ,, *Magnesico Gaseosa*		752
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,, ,, ,, *Forte*		235
,, ,, *Cloruro Mercurioso Precipitado*		630
,, ,, *extracto de Belladona*		235
,, ,, *Iodeto de Potassio Iodada*		670
,, ,, *Ioduro Potasico Iodado*		670
,, *Mercurial*		604
,, ,, *Simple*		604
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,, ,, *Oxido Amarillo de Mercurio*		619
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,, ,, *Yodol*		665
,, ,, *Yoduro de Potasio*		956
,, ,, ,, *Potasico con Extracto de Cicuta*		957
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,, *Fenata*		34
,, *Mercuriale*		604
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,, *Belladonée*		235
,, *de Calomel*		630
,, *Camphrée*		312
,, *de Chloroforme*		377
,, *Epispastique Jaune*		321
,, ,, *Verte*		321
,, *de Goudron*		909
,, *d'Iodure de Potassium Iodure*		670
,, *Mercurielle Faible*		604
,, *Naphtholée*		805
,, *d'Oxyde de Mercure Jaune*		619
,, *de Phenol*		34
,, ,, *Salicylate de Phenyle*		1039
,, ,, *Styrax*		1008, 1171
,, *Sulfureuse*		933
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Potassa Caustica		927
,, ,, *por la Cal*		928
,, ,, *Fusa*		928
,, *cum Calce*		931
,, Sulphurata	1 to 5 gr.	932
Potasii Acetas	10 to 60 gr.	933
,, *Benzoas*	15 to 20 gr.	935
,, Bicarbonas	5 to 30 gr.	935
,, Bichromas	$\frac{1}{10}$ to $\frac{1}{5}$ gr.	937
,, *Bitartras*		966
,, Bromidum	5 to 30 gr.	939
,, Carbonas	5 to 20 gr.	942
,, *Cantharidas*		322
,, Chloras	5 to 15 gr.	944
,, Citras	10 to 40 gr.	947
,, ,, *Effervescens*		948
,, *Cyanidum*		949
,, *Ferrocyanidum*		950
,, *Guaiacol Sulphonas*		587
,, Hydras		927
,, *Hydroxidum*		928
,, *Hypophosphis*		951
,, Iodidum	5 to 20 gr.	952
,, Nitras	5 to 20 gr.	957
,, *Osmas*		67
,, *Oxychinolin Sulphonas*		991
,, Permanganas	1 to 3 gr.	960
,, *et Sodii Tartras*		1088
,, *Sozoiodolas*		1138
,, Sulphas	10 to 40 gr.	963
,, *Sulphocarbolas*		37
,, Tartras	30 to 240 gr.	964
,, ,, Acidus	20 to 60 gr.	966
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,, *Cantharidate*		322
,, Dichromate		937
,, *Guaiacol-Sulphonate*		587
,, Hydrate		927
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Psylli Semen		971
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,, ,, *Salicylici Compositus*		77
,, *Acetanilidi Compositus*	3 to 5 gr.	8
,, *Aerophorus Laxans*		1090
,, *Aloes et Canellæ*		124
,, Amygdalæ Compositus	60 to 120 gr.	155
,, ,, *Laxativus*		574
,, Antimonialis	3 to 6 gr.	170
,, Aromaticus, *vel* Pulv. Cinnam. Comp.		399
,, ,, *Compositus*		399
,, *Basilicus*		630
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,, ,, ,, *Amyli*		631
,, ,, ,, *Zinci Oxidi*		631
,, ,, *cum Rheo*		631
,, Catechu Compositus	10 to 40 gr.	347
,, Cinnamomi Compositus	10 to 40 gr.	398
,, Cretæ Aromaticus	10 to 60 gr.	457
,, ,, ,, c. Opio	10 to 40 gr.	457
,, ,, *Compositus*		457
,, *Cynoglossi Compositus*		472
,, Doveri		688
,, *Effervescens Laxans*		1090
,, Elaterini Compositus	1 to 4 gr.	482
,, Glycyrrhizæ Compositus	60 to 120 gr.	573
,, *Guaiaci Compositus*	20 to 40 gr.	583
,, *Hydrargyri et Rhei*		1016
,, ,, *Subchloridi Compositus*		630
,, *Iodoformi Compositus*		664
,, Ipecacuanhæ Compositus	5 to 15 gr.	688
,, ,, *sine Emetina*		675
,, ,, *Opiatus*		688
,, ,, *et Opii*		688
,, ,, *Thebaicus*		688
,, Jalapæ Compositus	20 to 60 gr.	703
,, *Kaladanæ Compositus*	20 to 60 gr.	708
,, Kino ,,	5 to 20 gr.	711
,, *pro Lacte Humanisato*		854
,, *Liquiritiæ Compositus*		573
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,, *Bismuth Sulphocyanide*		991
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,, Semina		1157
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,, ,, *Exsiccatum*		1158
,, *Cinnamas*		1159
,, *Iodidum*	7½ to 15 gr.	1159
,, *Lactas*	20 to 30 gr.	1159
,, *Salicylas*	5 to 15 gr.	1160
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Strophanthi Semina		1161
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,, *Nitras*		1169
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,, ,, *factitius*		728
,, Conii	1 to 2 fl. drm.	438
,, *Digitalis*	5 to 10 min.	478
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,, *Liquiritiæ*		572
,, *Mori*		776
,, Scoparii	1 to 2 fl. drm.	1066
,, Taraxaci	1 to 2 fl. drm.	1194
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,, ,, *Cuivre*		466
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,, ,, *Sodium Officinal*		1130
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,, ,, *Eserina*		889
,, *Ferroso*		530
,, *Magnesico*		752
,, *Mercurico*		609
,, *Potasico*		963
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,, *Borated*		1192
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Tannalbin	15 gr.	87
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,, *Wool*		87
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,, ,, *Panama*		980
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,, *Chia*	5 to 10 gr.	1198
,, *Copahiba*		444
,, *Laricis*		717
,, *Veneta*		717
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,, *Sodium Acetate*	4 gr.	1206
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,, *Cigarette*		87
,, Cotton.		575
,, *Cyllin*		472
,, *Eucalyptus*		498
,, Fat.		100
,, ,, Hydrous		102
,, *Hamamelis*		595
,, *Iodised*		671
,, *Iodoform*		664
,, *Krameria*		715
,, *Salicylic*		77
,, *Sublimate*		625
,, *Tannic*		87
,, *Thymol*		1210
Woorara	$\frac{1}{12}$ to $\frac{1}{2}$ gr.	468
Wormwood		1

	Dose.	Page
Xarope de Casca de Limao		726
,, ,, *Dormideiras*		858
Xarope de Rhuibarbo		1015
Xeroform		258

	Dose.	Page
Yeast	$\frac{1}{2}$ to 1 oz.	1236
,, *Cakes*		1236
,, *Compressed*		1236
Yellow Wash		624
Yerba Santa		1237
Yeso		294
Yodo		666
Yodoforms		660
Yoduro di Ammonio		146
,, *de Arsenico*		194
,, ,, *Azufre*		1181
,, *Ferroso*		519
,, *Mercurio*		610
,, *Mercurioso*		613
,, *de Plombo*		915
,, *Plumbico*		915
,, *de Potasio*		953
,, *Potasico*		952
,, *Sodico*		1118
Yohimbine		1236
,, *Hydrochloride*		1237

	Dose.	Page
Zafferano		457
Zanzibar Aloes		118
Zarzaparilla		1054
Zeitlosenknollen		426
Zeitlosensamen		429
Zenzero		1256
Zimmtol (Cassia)		397
Zinc Chloride Points		1244
,, ,, ,, *Comp.*		1244
,, *Gelatin*		1249
,, *Hydroxycarbonate*		1241
,, *Oxide Plaster Mulls (Unna)*		1249
,, *Phenol-para-Sulphonate*		1252
,, *and Salicylic Plaster Mull (Unna)*		1249
Zinc-iso-Valerianate		1254
Zinci Acetas	1 to 2 gr.	1239
,, *Bromidum*	2 gr.	1240
,, Carbonas		1241
,, ,, *Præcipitatus*		1241
,, Chloridum		1242
,, *Ichthyolsulphonas*		655
,, *Iodidum*	$\frac{1}{2}$ to 2 gr.	1244
,, *Lactas*		61
,, *Nitras*		1245
,, *Oleas (Shoemaker's)*		1249
,, Oxidum	3 to 10 gr.	1245
,, *Permanganas*		1249
,, *Phenolsulphonas*		1253
,, *Phosphidum*	$\frac{1}{20}$ to $\frac{1}{4}$ gr.	1249
,, *Sozoiodolas*		1138
,, Sulphas	1 to 3 gr.	1249
,, *Sulphis*		1251
,, Sulphocarbolas		1252
,, Valerianas	1 to 3 gr.	1254
Zinco-hæmol		593
Zincum		1238
,, *Sulphophenolicum*		1253
Zingiber		1256
Zittmann's Decoction		1057
,, *Pills*		630
Zucchero		1033
Zucker		1033
Zuckerhaltiges Ferrocarbonat		510
Zumo de Limon		727
,, ,, *Moras*		776
Zymocide		26

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PHARMACY

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